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Proceedings

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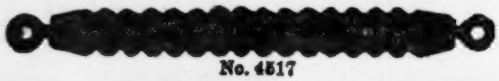
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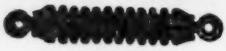
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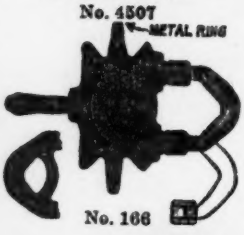

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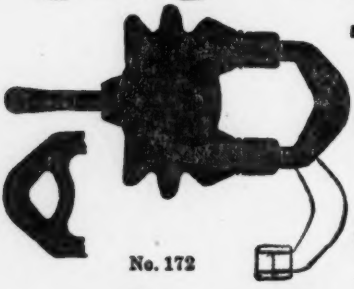
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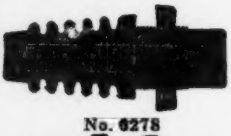
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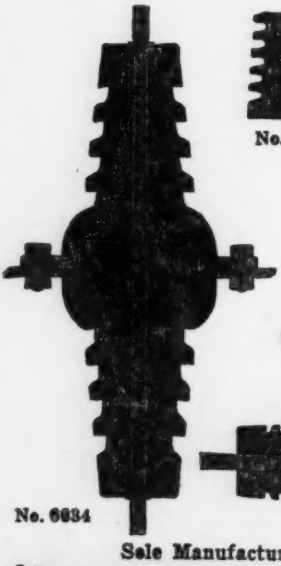
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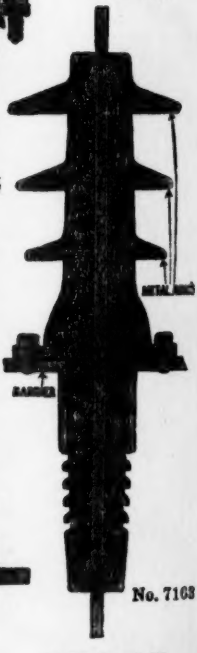

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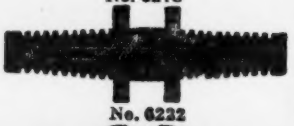
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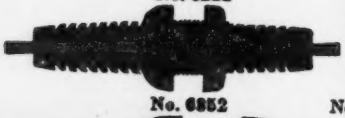
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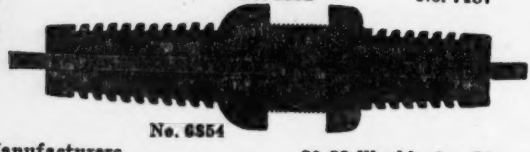
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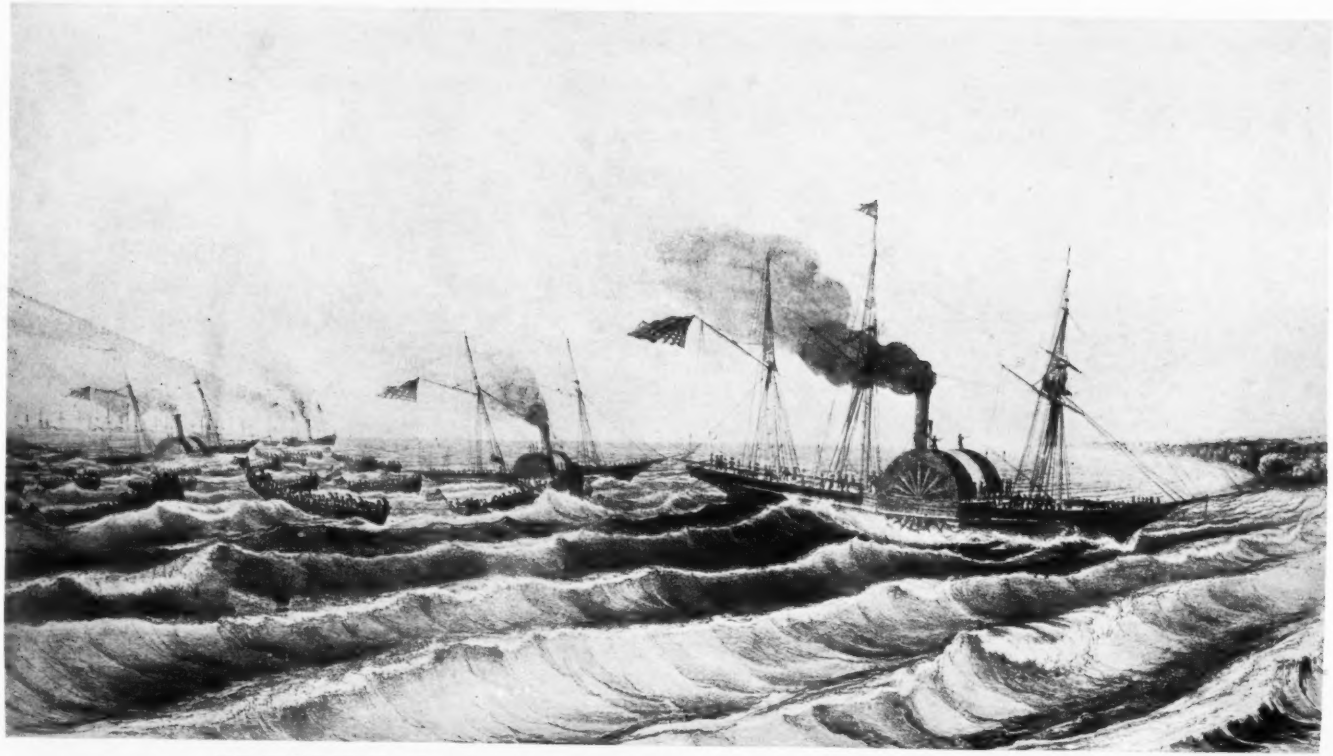

THE UNITED STATES STEAMERS SCORPION, SPITFIRE, VIXEN AND SCOURGE. WITH 40 BARGES IN TOW,
CROSSING THE BAR AT THE MOUTH OF TOBASCO RIVER. MEXICO.

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THE UNITED STATES STEAMERS SCORPION, SPITFIRE, VIXEN AND SCOURGE, WITH 40 BARGES IN TOW, CROSSING THE BAR AT THE MOUTH OF TOBASCO RIVER, MEXICO.

"ALVARADO HUNTER"

A BIOGRAPHICAL SKETCH

By Rear Admiral Caspar F. Goodrich, U. S. Navy

INTRODUCTORY

For some time past I have thought that too little is generally known of our minor naval heroes, men who served their country faithfully; took their full share in her battles; on occasion offered up their lives on the altar of patriotism, their last great sacrifice; but, who, from causes beyond their control, failed to achieve the national distinction of a John Paul Jones, Barry, Hull, Decatur, Bainbridge and Farragut among others whose memory their fellow countrymen still delight to honor. It was but natural, therefore, that I should gladly seize upon the opportunity, so kindly extended by Lieutenant George T. Emmons, U. S. Navy, of running over some of the papers accumulated and preserved with scrupulous care by his father, the late Rear Admiral George F. Emmons, U. S. Navy. Almost the first item to meet my eye contained the charges against the late Lieutenant Charles G. Hunter, U. S. Navy, with the sentence of the court and the public reprimand pronounced by his commander-in-chief at the time of the Mexican War. This, a *cause célèbre* of that day, is referred to more or less briefly in all naval histories. From the episode which gave rise to the court martial, Hunter acquired the soubriquet of "Alvarado," by which he has since been universally known. The finding in Admiral Emmons' papers of copies of the original docu-

ments in this affair seemed a call to put into practice my rather vague idea of reviving interest in the sailors whose service in subordinate capacities, however valuable, still lack that public recognition to which they appear to be entitled. To the query, "Why not begin with Alvarado Hunter?" I could make no reply other than an acceptance of the task which chance appeared to have allotted me. If I can depict the splendid gallantry he displayed on the Mexican coast and tell of the grave injustice to which he was subjected in consequence, I shall have discharged a portion of a self-imposed duty; but fairness to all concerned necessitates an attempt to bring to light the character of the man himself, with his faults, errors, misfortunes as well as his virtues and his successes, for Hunter's nature was an extraordinary mosaic of strengths and weaknesses.

EARLY YEARS

The subject of this sketch was born November 9, 1809, in Trenton, N. J., the son of an eminent lawyer of that city. He was admitted to West Point on July 1, 1824, as appointed from the state of New Jersey. On November 30 of the same year he tendered his resignation for reasons not to be found, the records of that institution having been almost completely destroyed by fire in 1838,[1] but it may be presumed that he preferred a naval career and sought transfer to the web-footed branch of the service. His warrant as midshipman was dated November 9, 1824. He joined the U. S. S. *North Carolina*, 74, from which, at Port Mahon, February 18, 1826, he forwarded the formal acceptance of his warrant. Why this long delay and what he did between the dates of his appointment and his acceptance are not known. He served three years on board of the *North Carolina*, then two more on board of the schooner *Porpoise* and the frigate *Java*, still in the Mediterranean. After an absence from home of nearly five years he returned (probably in the *Java*) to be examined for promotion. On February 20, 1830, he was made a "passed midshipman," thus mounting the first step of the hierarchical ladder.

It is about this time that the official record begins to show evidence of Hunter's disposition, which was certainly wayward

[1] Letter of Colonel C. P. Townsley, superintendent of the Military Academy.

if not indeed occasionally quarrelsome. The particular occurrence in illustration had a tragic ending. It may thus be summarized. Towards the close of the year 1829, at a dinner in Philadelphia, a Mr. G. made a remark which was considered offensive by a Mr. D. The dispute was amicably settled. Early in 1830, Dr. D., a brother of D., received an unpleasant anonymous letter and charged G. with its writing. G. denied the charge and sent to D. a challenge which D. refused to accept. Now appeared on the scene Midshipman Duryee as G.'s friend and William Miller, a promising young lawyer of Philadelphia, as D.'s friend. Midshipman D. denounced D., who challenged him. A Lieutenant Westcott turned up as Midshipman D.'s friend. Being a strict interpreter of the code, W. declared that Midshipman D. should not meet D. until D. had met G. A written request that a joint conference be held by friends of Duryee and D. was refused by Miller who did not wish to reopen the controversy. Hunter, as Duryee's friend, visited Miller and obtained a promise that the written request just mentioned should be destroyed. After Miller had burnt all the copies believed to exist, the letter appeared in print, whereupon Hunter charged Miller with the responsibility of the publication and challenged him. Miller, having declined the challenge, was posted as a coward and had to fight. The duel took place March 21, 1830, near Chester, Pennsylvania. Miller was killed at once. Gazing at the prostrate form, Hunter said: "Gentlemen, I assure you that I had no enmity against that man. His blood must rest upon the heads of others who dragged him into the quarrel."[2] It was averred by those who knew Lieutenant Hunter well that remorse for this fatal act haunted him through life, inducing a restless craving for distraction of mind which made constant excitement a necessity to him.[3] Ten days later all the naval officers implicated in this sad affair, including Hunter, were summarily dismissed by President Jackson.

We should not judge Hunter and his colleagues too harshly or by the standards of to-day, when nothing is more unusual or seems

[2] *United States Gazette*, March 24, 1830, which also prints the correspondence preceding the duel. For other details, see Dr. Chas. O. Paullin's "Duelling in the Old Navy," PROC. NAV. INST., No. 132; also, the "Fatal Duel between Hunter and Miller," Jonathan Elliott, Washington, 1830.

[3] Newspaper clipping of 1856, pasted in the Philadelphia Library's copy of Sabines' "Notes on Duelling."

more barbarous than the duello. In his time the "code" was not only reverenced in theory, but was followed as a practical guide in the conduct of officers and of those who called themselves gentlemen. None the less, this instance appears to have been exceptionally cold-blooded and unnecessary. A contemporaneous obituary of Hunter states that

> warrants were issued for his arrest, and he was forced to flee to avoid apprehension. He first went to Boston, and from thence to Montreal. He soon after returned in disguise to New Jersey, and remained for some time secreted in the house of a Mrs. Griffiths, in the town of New Brunswick. While so secreted he became enamored of his protector's daughter, and was subsequently married to her. When the commotion caused by the duel had in some measure subsided, he went to Washington, obtained an interview with General Jackson, explained all the facts connected with the duel, and solicited to be restored to his former position. The President listened silently to the young man's appeal, and answered it by saying, "I will think of the matter." The next day young Hunter received notice that through the partiality of the President he was restored to his former post.[4]

This is not strictly accurate, for he was put at the foot of the list of passed midshipmen and not allowed pay for the time he was out of the navy.[5]

Part of the year of his restoration (1833) he commanded the schooner *Shark*, one gun, employed in the protection of timber on our southern coast. From the *Shark* he was transferred to the sloop-of-war *Falmouth*, 18 guns, in the West Indies squadron. His promotion to the grade of lieutenant is dated June 24, 1834.

His next cruise, 1837, on board of the frigate *United States* in the Mediterranean, was marked by his court martial for "gross and ungentlemanly conduct" and "misstating facts." The whole affair seems trivial, not to say amusing. The *United States* was lying in Port Mahon, Minorca Island, in the company of some other vessels, notably the French and British flagships. To create diversion, the American officers arranged a race on shore, Hunter backing a horse against a mare, the former to receive a stated distance allowance. At the conclusion of the race one of the judges, without consulting the others, declared the horse "distanced"—a finding which Hunter, who was close to the distance line, saw to be incorrect. He therefore at once entered a vigorous, not to say noisy, protest which naturally occasioned some dispute. Perceiving the confusion, his commander-in-chief, Commodore

[4] *Pennsylvanian*, March 7, 1856.
[5] Navy Department Records.

Jesse D. Elliott, rode up to the scene on a jackass, gesticulating wildly with a heavy walking stick, which he also used to prod his reluctant mount, and calling out repeatedly to Hunter "not to separate the officer from the gentleman." To this Hunter replied each time that he had not and never did. Whereupon the irate commodore ordered him off to his ship, put him under suspension and three days later brought him before a general court martial. The evidence, as solemnly printed in Executive Documents of the 25th Congress, makes delightful reading. Incidentally we get an idea of the real Hunter as known to his contemporaries. Witnesses testifying as to his character spoke of him as of "an energetic disposition"; as in manner "rather earnest and determined"; as "generally quick and with feeling." Of the charges preferred against him Hunter was "fully acquitted."

Did that end the matter? Quite the contrary. In his written defence he refers to Elliott's age, rank and achievements in such handsome terms as to make the latter believe them to have been sarcastic—which they doubtless were. So immediately he court-martialed Hunter again for using "contemptuous and satirical language to his commander-in-chief." The result was the same as in the first trial; the court promptly acquitted him. Whereupon Hunter preferred charges against Elliott and sent them to the Navy Department. No action followed.[6]

It is probable that Commodore Elliott, chafing under his failure to discipline Hunter and resenting Hunter's report to the Secretary of the Navy, sent him home at the earliest opportunity; for he was on leave the first of January, 1838, and was kept off duty until some time in 1839, when he joined the receiving ship at Norfolk. That he was again on leave January 1, 1841, is a bit suggestive of another row, of which, however, no record has been found.

On board the sloop-of-war *Fairfield* in the Mediterranean he made a three-year cruise which seems to have been peaceful so far as he was concerned, although marked by the mysterious murder at Port Mahon in 1842 of his mess-mate Patterson, the sailing master of the *Fairfield*. Late one night, while descending the hill by the winding path which led to the landing place and preceding, at some little distance, Hunter and the *Fairfield's* surgeon, Patterson was attacked and stabbed to the heart. His

[6] Executive Documents, 25th Congress, 3d Session, Vol. III, 1838-1839.

cry brought his companions to his side, the surgeon to his aid, Hunter to pursue the murderer, undoubtedly a native, who unfortunately made his escape in the darkness.[7]

During 1845 and 1846 he is briefly noted in the official records as on leave or waiting orders.

THE ALVARADO AFFAIR

Since men-of-war of that day were, with few exceptions, sailing vessels, our naval operations in the Gulf at the time of the Mexican War were hampered by the lack of steamers. To supply this deficiency the government purchased a number of such craft, among which was the *Bangor,* built in 1844 on the Delaware to ply between Boston and Bangor.[8] She was an iron paddle wheeler of only 230 tons, armed with one small gun and carrying a crew of but 50 men. Renamed the U. S. S. *Scourge,* she was sent early in 1847 to Vera Cruz under the command of Lieutenant Charles G. Hunter, who was directed to report to Commodore Matthew C. Perry, then the commander-in-chief of our naval force in Mexican waters. The speed of this tiny boat may be inferred from the fact that she was 12 days making the passage from New York to Havana where she spent two or three days, probably for coal and provisions. A man of Hunter's energy would not tarry unnecessarily on his way to the seat of war. We can imagine his disappointment on reaching Vera Cruz the very day, March 28, 1847, it was surrendered. However, an opportunity for service against the enemy offered itself immediately. How well he profited by it!

Some 30 odd miles to the southward of Vera Cruz lies the town of Alvarado at the mouth of the river of the same name. At the time of which we are writing it was so heavily fortified as to be looked upon, next to Vera Cruz, as "the Gibraltar of the Gulf."[9]

Twice during the previous year it had been attacked by our ships-of-war. On both occasions the latter were beaten off. These failures had created a great deal of dissatisfaction in the United States and an ardent longing in our fleet to retrieve a defeat. Its capture was furthermore desirable because at Alvarado was a large number of mules and horses much needed by the army in its contemplated advance on the city of Mexico.

[7] Parker's "Recollections of a Naval Officer."

[8] *San Francisco Argonaut,* January 29, 1916. Niles' Register, May 15, 1847.

[9] *Philadelphia Public Ledger,* May 19, 1847.

LIEUTENANT CHARLES HUNTER.

Between General Scott on shore and Commodore Perry afloat a joint expedition was at once planned against Alvarado. General Quitman, with a brigade reinforced by the 4th Regiment artillery, was to march overland and cut off the retreat of the enemy, whom Perry was to shell out of the town. The scheme was sound. There seemed to be no likelihood of its not being carried out most successfully to the great glory of Perry and Quitman.

How important this enterprise was deemed at Vera Cruz is seen in the following extracts from Vera Cruz letters of the day:

General Scott has shown great promptitude in following up his victory. A sufficient force to take Alvarado was immediately despatched under General Quitman.

Commodore Perry, with some of the smaller vessels of the navy, was to sail down to Alvarado to co-operate with General Quitman's brigade, and if resistance was made to attack the place by land and water.[10]

Since Perry's heavy ships were sailing vessels he ordered Hunter to proceed in advance and "watch the port." What Hunter actually did is told by a lieutenant of Perry's flagship, the frigate *Potomac,* William H. Parker, who, in his "Recollections of a Naval Officer," gives us this story:

As we approached the bar, we saw that something was wrong as the vessels were all under weigh instead of being at anchor. Very soon the *Albany* hailed us and said that Alvarado was taken. "By whom?" asked our captain. "By Lieutenant Hunter in the *Scourge*" was the reply. And so it was. Hunter, the day before, had stood in pretty close and observing indications of *flinching* on the part of the enemy, he dashed boldly in and captured the place almost without firing a gun. Not satisfied with this, he threw a garrison, *consisting of a midshipman and two men,* on shore and proceeded in his steamer up the river to a place called Tlacotalpan which he also captured.[11]

When General Quitman arrived with his brigade and the place was gravely delivered over to him by Passed Midshipman William G. Temple, he was greatly amused and laughed heartily over the affair.

The accounts say that when the fleet got down to Alvarado, and Lieutenant Marin with five men to garrison a town and seven forts, delivered the command of them to Commodore Perry, all the officers and men in the squadron were convulsed with laughter, and their roars induced the inhabitants of Vera Cruz to believe Alvarado was bombarded.[12]

The following is Hunter's own account of the affair, and the articles of capitulation of both the towns captured:

[10] Vera Cruz letters, summarized in the *Pennsylvanian,* April 13, 1847.
[11] Parker's "Recollections."
[12] *Philadelphia Public Ledger,* April 20, 1847.

U. S. STEAMER "SCOURGE"
ALVARADO, April 2d, 1847.

Sir: I have the honor to report that on the afternoon of the 30th ultimo, at about 5 o'clock, I arrived off the bar of this river; that I immediately opened upon the forts with round shot and shell; but finding a heavy surf on the bar, and seeing indications of a norther, I stood off and on during the night. In the morning I again opened on the forts, when I discovered a white flag on the beach, and, shortly after, the captain of the port and a pilot came off with a flag of truce, offering a surrender of the place, and informing me that the Mexican troops (to the number of three or four hundred) had, after our attack, evacuated the forts and city the night previous, having first fired all the government vessels, spiked a portion of the guns, and buried others in the sand. With a view of preventing any further destruction of public property, or a return of the Mexicans before your arrival, and for the purpose of securing an unobstructed entrance for the squadron, I came in, anchored off the town, received their surrender, (a copy of which I herewith enclose) hoisted the American flag under a salute of twenty-one guns, and then, hearing that the garrison of the place were hastening up the river with two or three vessels loaded with arms, ammunition, and other public property, I left Passed Midshipman Temple, with five men, in command of the place, and stood up the river after them. On the way up I succeeded in capturing four schooners; one I burned, as I could not get her off; another I left behind as worthless; the third I towed down; and the fourth is now coming down under the command of Passed Midshipman Pringle. At 2 o'clock in the morning I anchored off Fla-co-Talpam, a city of about 7000 inhabitants, sent Lieutenant Marin ashore to the alcade, assembled the junta and demanded an entire and unconditional surrender within half an hour. My demands were at once complied with, and I herewith transmit a copy of their surrender.

I am, &c.
(Signed) C. G. HUNTER, Lt. Comnd'g.

To Commodore M. C. Perry, Commander-in-Chief of the Gulf Squadron.

THE TERMS OF CAPITULATION

TOWN OF FLA-CO-TALPAM, 1st April, 1847—2 o'clock A. M.—

Present, the constitutional Alcalde and citizens who compose this illustrious council on the one side, and on the other Captain C. G. Hunter, of the United States steamer *Scourge*, accompanied by the second lieutenant of that vessel, M. C. Marin; the object being to enter into such negotiations as shall be suitable for the welfare of the inhabitants, and better understanding with that nation, the terms expressed in the following articles were agreed to by both parties:

First.—The town of Fla-co-Talpam hereby declares its perfect neutrality towards the forces of the United States, and also its entire submission to them as long as existing circumstances continue.

Second.—In consideration of this, the said Captain, in the name of the government, whose commission he holds, binds himself that the right of

individuals shall be respected, as also their persons and private property likewise the Catholic religion, and the free exercise of its forms of worship.

And for the fulfilment and faithful observance of this compact, both the contracting parties hereby bind themselves by all the forms usual; and in testimony of the same, they have hereby subscribed their names to two copies of this contract, each of the same tenor and date. Done by the Alcalde, presiding officer of this council, and the before-named second lieutenant, who assisted in arranging this negotiation, and who is commissioned to sign for the before-mentioned Capt. Charles G. Hunter.

(Signed) PEDRO ATALPICO
M. C. MARIN, Lieut. U. S. N.

The town of Alvarado having been left defenceless, surrenders itself to the United States steamer *Scourge*, Captain C. G. Hunter, on the following conditions:

First.—That the forces of the United States will respect and protect the Roman Catholic religion.

Second.—That they solemnly guarantee complete and entire protection to the inhabitants of this town, and all species of property, it being distinctly understood that no public edifice or private house shall be taken or used by the United States forces, unless some previous arrangement shall have been made with the owners.

JOSE RUIZ PARRA,
President of the Council.
M. C. MARIN,
Lieut. U. S. Navy.

ALVARADO, 31st March, 1847.

A newspaper of that time says:

We can imagine the feelings with which Commodore Perry must have surveyed his squadron of vessels and the military force on shore, all set forth in the pride and puissance of war to take the town of Alvarado, which had been already taken by a single vessel without firing a shot. Had Commander Hunter not converted the blockade into an attack, and permitted the land and naval forces to come down upon, and reduce the city, the credit would have been given to the imposing force, and another laurel leaf would have graced the chaplets which Perry and Quitman wear. But as it is, the vessels lie quietly off the town, which the *Scourge* has taken, or have proceeded North, and Gen. Quitman having marched far enough to find his intended work done to his hands, has quietly marched back again.

It may be proper, but we think Commodore Perry should have mentioned how Alvarado was taken and not permit the impression to go to the department that the combined forces reduced the city. Commander Hunter's name is not mentioned, and it deserves that for the gallantry of the act, at least, even if he is under arrest for transcending orders.[12]

The foregoing paragraphs give the facts in the case. To compare them with Commodore Perry's official report which follows

[12] *United States Gazette*, April 24, 1847.

makes one marvel how so big a man as he really was could have descended to such a level of spiteful pettiness:

UNITED STATES FLAG SHIP "MISSISSIPPI."
ANCHORAGE ANTON LIZARDO.
April 4, 1847.

Sir: I have the honor to inform the Department that immediately after the surrender of Vera Cruz, General Scott and myself concerted measures for taking possession of Alvarado. Although it was not expected that any defence would be made, it was thought advisable that strong detachments, both of the army and navy, should be employed, in view of making an imposing demonstration in that direction. The southern brigade under General Quitman was detached for this duty, and the naval movements were directed personally by myself [*sic*]. As it had been anticipated, not the slightest opposition was offered by the enemy, and the river and town were quietly occupied on the 2d instant by the combined forces of the army and navy. (!)

General Quitman took up his line of march this morning, on his return to Vera Cruz, and I left for this anchorage to arrange an expedition to the north; Captain Mayo, with a small naval detachment, being placed in command of Alvarado and its dependencies, in which may be embraced the populous town of Tlacotalpam, situated about twenty miles up the river.

In this expedition I have had the good fortune to become acquainted with General Quitman and many of the officers of his command, and have been gratified to observe a most cordial desire, as well with them as with the officers of the navy, to foster a courteous and efficient co-operation.

The enemy, before evacuating the place, burnt all the public vessels, and spiked or burned most of the guns, but those that were concealed have been discovered, and I have directed the whole number—about sixty—either to be destroyed or shipped, with the shot, on board of the gun boats, as they may be found of sufficient value to be removed.

With great respect, I have the honor to be your most obedient servant.

M. C. PERRY,
Commanding Home Squadron.

The Hon. John G. Mason, Secretary of the Navy.[14]

It is a tax on one's credulity to be asked to believe that this report is authentic. The answer may lie in Tertullian's remark, "*Credo quia impossible est.*" Yet the formal official document purports to describe events in which Perry had no part or lot and it does not even mention the man who had the wit to perceive and the courage to act, who after taking Alvarado pushed up the river some 30 odd miles, anchored off Tlacotalpan in the middle of the night, sent Lieutenant Marin ashore with a peremptory demand that the *ayuntamiento* or town council should meet at once and surrender the place, giving them half an hour for this purpose else would he

[14] *Pennsylvanian*, April 4, 1847.

"open on the town and *order the troops to advance!*" Since he had not a soldier or marine within call, was there ever in all history a more splendid, more audacious bluff than this? Yet it worked to perfection. Having left one midshipman and five bluejackets to hold and garrison Alvarado with its seven forts he left a lieutenant and three seamen to occupy Tlacotalpan with its 7000 inhabitants.

Lest it be thought that this account is exaggerated here are Hunter's letters *in extenso*.

U. S. STEAMER "SCOURGE"
ALVARADO, March 31st, 1847.

Sir: The surrender of the City *must be made* in 30 minutes from this time and *must be* unconditional.

If at the expiration of that time they do not agree to our terms I will open upon the town and order the troops to advance.

(signed) C. G. HUNTER
Lieutenant Commanding.

To Lieutenant M. C. Marin
at the Governor's House
Alvarado.

To be read to the Justices in Council Assembled.

No. 2. U. S. STEAMER "SCOURGE"
OFF TLACOTALPAM, March 31st.

Sirs: In order to avoid unnecessary bloodshed and in accordance with the spirit and feeling of civilized nations, I demand in the name of the United States of America an entire and unconditional surrender of the town of Tlacotalpam.

I have the honor to be, Sirs,
Yours &c,
C. G. HUNTER.

To the President and Ayuntamiento
of the City of Tlacotalpam.[15]

And what reward did Hunter receive for these magnificent services worthy of a Cushing? He was court-martialed! Incredible again, but true. The official record must once more be quoted in proof, and it is only proper that it be quoted in full.

CHARGES AND SPECIFICATIONS OF CHARGES, PREFERRED BY COMMODORE M. C. PERRY, COMMANDER-IN-CHIEF OF THE U. S. NAVAL FORCES IN THE GULF OF MEXICO, AGAINST LIEUTENANT CHARLES G. HUNTER, U. S. NAVY, LATE COMMANDING THE U. S. STEAMER "SCOURGE"

CHARGE FIRST.—Treating with contempt his superior, being in the execution of his office.

[15] Emmons collection.

Specification 1st.—In that the said Lieutenant Charles G. Hunter U. S. Navy, did on the 31st day of March, 1847, being then in the command of the U. S. Steamer *Scourge,* enter the Port of Alvarado, and did there arrogate to himself (the said Lieutenant Charles G. Hunter) the authority and powers that are vested only in the Commander in Chief, by entering into stipulations for, and receiving the surrender of Alvarado and its dependencies.

Specification 2d.—In that the said Lieutenant Charles G. Hunter, U. S. Navy, did on the 31st day of March 1847, with the U. S. Steamer *Scourge* under his command, proceed from Alvarado to the town of Tlacotalpam, without any orders or authority, and there demanded the surrender of the said town of Tlacotalpam, and enter into and sign articles of capitulation, although aware of the immediate approach of the Commander-in-chief, to whom alone such powers are confided, thus treating with contempt the authority of his Superior Officer being in the execution of his office.

Specification 3d.—In that the said Lieutenant Charles G. Hunter, U. S. Navy, did on the 31st day of March 1847, in proceeding from Alvarado to Tlacotalpam, capture four schooners; one of which he set on fire and burned, and another he abandoned, thus substituting his own will for the discretion of the Commander in Chief, who was within a few hours reach of communication; and treating with contempt the authority of his superior; all of which in violation of the laws of the United States as contained in "an act for the better government of the Navy of the United States, approved April 23d, 1800."

CHARGE SECOND.—Disobedience of Orders.

Specification 1st.—In that the said Lieutenant Charles G. Hunter, U. S. Navy, having been ordered to report to Captain Samuel L. Breese and to assist in blockading the port of Alvarado, did in disobedience or disregard to said orders enter the harbour and take possession of the town of Alvarado.

Specification 2d.—In that the said Lieutenant Charles G. Hunter, U. S. Navy, having been ordered on the evening of the 1st of April 1847, to report himself in person to the commander in Chief, at his quarters in the town of Alvarado, at 10 A. M. of the following morning, did disobey said order. All of which is in violation of the laws of the United States as contempt in "an act for the better government of the Navy of the United States, approved April 23d, 1800.

(signed) M. C. PERRY
Commander-in-Chief
U. S. Naval Forces
Gulf of Mexico.[18]

In justice to Hunter's memory and as showing how lofty were his professional principles, how great his respect to his seniors, even to one who had so grossly abused the prerogatives of his office, how plain and straightforward his speech, let us hear what he himself said in his defense against such unheard of charges.

[18] Emmons collection.

Mr. President and Gentlemen of the Court: I will not trouble you with unnecessary verbiage, but proceed at once to the point. My orders were, (as stated in the 1st spec. 2d charge) to report to Capt. Breese, and to assist in blockading Alvarado. I did not consider them (can they be fairly considered?) as forbidding me to annoy the enemy in every way in my power, as modifying in the slightest degree the general duty of every officer having a military command in time of war, to molest and cripple the enemy in every possible way. On the evening of the 30th March, being sufficiently near, I opened upon the fort at Alvarado with shot and shells. Apprehensive of a norther, I stood off and on during the night, with a strong breeze and rough sea. Towards morning, it having moderated, I stood close in to the bar, and again opened upon the forts. Shortly afterwards, I discovered two horsemen upon the beach, holding a white flag, and a boat crossing the bar at the same time. This boat brought me an offer on the part of the authorities to surrender the city. Permit me here to observe, Mr. President, that as there are two sides to every question, so there may be two results to every affair of this kind. Alvarado is now in our possession; but let us suppose that it was not to be: that we had been foiled a third time in our efforts to take it. What would have been my position, I say, if I, having refused the offer of the town when the authorities were ready to yield it—the American forces had been a third time baffled in their efforts to capture it? Mr. President, the worst that can now befall me is a trifle to the infamy and disgrace which would have remained attached to my name, perhaps, long after I was in the grave. If you, Mr. President, (or any member of this honorable Court,) will fancy yourself in my place when the offer of capitulation reached me, I think you must perceive that it placed me in a difficult, a most embarrassing position—one that might have got a much more experienced officer than myself into trouble. I had to decide upon the disobeying of my orders on the one hand, and the possible consequences which my refusal to take such a responsibility might lead to on the other. I had to decide between two courses—the one leading to present personal safety, and the possibility of future infamy; the other to some personal risk, perhaps, but by which the honor of the navy and my honor, at least, were safe. I have stated thus the view which I took of my position, and the motives on which my actions were founded. I will not say, Mr. President, that under similar circumstances you would have taken a similar view of your position; but I think I may say without the danger of dissent, here or elsewhere, that taking the same view I did, you or any other member of this honorable court, would have done just what I did. My summons for the surrender of the city of Alvarado, was not made until the authorities hesitating to sign the articles of capitulation, I thought myself entrapped, when it became necessary to use strong measures and strong language. Upon the reception of that summons, they signed the articles, and in the name of the United States of America, I took possession of Alvarado and its dependencies. Shortly afterwards, I learned that after our attack the evening previous, the garrison had fired the public vessels, spiked and buried their guns, placed a large quantity of government property, chiefly munitions of war, on board of several small vessels,

and were proceeding up the river in the direction of the city of Fla-co-Talpam. I followed, as I conceived it to be my duty, and captured one of them loaded with arms, &c., that got ashore, and burned her to prevent her falling into the hands of the enemy. Another, worthless to ourselves or the enemy, and abandoned, and two others, I brought to Alvarado. The pursuit of these vessels led me to the city of Fla-co-Talpam, where I arrived about two o'clock in the morning; trusting to the suddenness of the attack, I ordered the junta to assemble, and demanded within thirty minutes an entire and unconditional surrender, and my demands were complied with. I contend, Mr. President, and gentlemen of the court, that all that happened after the capitulation of Alvarado, followed as a natural and necessary consequence, (not, however, foreseen by me,) when I first accepted their offer to surrender. I contend that my error consisted in the original disobedience of my orders, (which, from what I have since learned, I regret,) and that what I did afterwards, I was in a great measure obliged to do. Knowing that several small vessels of the enemy, laden with military stores, were within my reach, could I doubt that it was my duty to destroy or capture them? Seeing, from the conduct of the enemy at Alvarado, that a panic prevailed among them, and that there was a prospect of success, I demanded the immediate and unconditional surrender of Fla-co-Talpam. I contend that these two acts followed as a necessary consequence to my first disobedience of orders. Of the motives that led to that step, I have made a honest exposition to the Court, and I hope that you will consider them, together with the difficulties of my position, and my want of experience in such matters, as some palliation of my fault. I regret my error, apart from the trouble it has brought upon me. I regret it, because it has given offence to the commander-in-chief. (I speak from rumor only—I have no certain knowledge of the fact,) as I have heard that was an understanding between the commander-in-chief and the commanding general ashore, that there was to be a combined attack made by the squadron and army, on these places; it might thus seem that I had sought to rob of its just participation in this affair that arm of the service which in the progress of this war, has acquired for itself and for our country, so much honor and glory. Nothing could be farther from my intentions—I knew nothing of any such understanding. One or two matters remain to be touched upon. I am charged in the two 1st spec. of the 1st charge, with arrogating to myself the powers of commander-in-chief, in signing articles of capitulation, &c., although aware of the immediate approach of the commander-in-chief. In regard to the first, my error was one of simple ignorance. I knew that I had obtained possession of these places, and meant of course to hand them over to the first senior officer that might approach; but I had not the remotest intention of exercising any of the powers of commander-in-chief. I knew, or perhaps I should rather say had reason to believe, that the commander-in-chief would arrive in a short time; but I did not know precisely when, still less did I know that he was nearer than Vera Cruz.

In the 2d specification of the 2d charge I am charged with having disobeyed an order to call at a specified time at the commander-in-chief's quarters.

Gentlemen, I was so absorbed by the difficulties that surrounded me, that his order to me to report myself, entirely escaped my recollection—this may seem a lame excuse, but it has at least the merit of truth. But, Mr. President, none of us are entirely free from occasional acts of forgetfulness; the honorable member yesterday who gave in his testimony, made a mistake, and I must say that the confidence with which I leave my case in his hands has been increased by the handsome manner in which he corrected his error when reminded of it.

Mr. President and gentlemen of the Court, I have been much mortified and excited, by the many and numerous difficulties that surround me. I have aimed at nothing but the glory of my country—the honor and dignity of the service to which I belong. I leave my case with perfect confidence in your hands.

C. G. HUNTER, Lieut. Comdg.

It is difficult to believe that in spite of these manly words he was found guilty of all the charges, except that of not reporting to Captain Breese, preferred against him. He was sentenced "to be dismissed the squadron" and reprimanded by the commander-in-chief, the reprimand "to be read on the quarter-deck of every vessel of the squadron, in the presence of the officers and crew." With what zest must the latter have performed his part in this regrettable affair may be inferred from his own letter to Hunter.

U. S. FLAG SHIP "MISSISSIPPI"

ANTON LIZARDO, April 9, 1847.

Sir: I inclose herewith the findings and sentence of the Court Martial convened for the 7th instant for your trial, which imposes upon me the task of expressing in the form of reprimand, my opinion of your conduct as proven before the Court. However lenient the sentence in your case may seem to be, I have approved of it, as I can conceive of no punishment more severe than a dismissal from a Squadron actively engaged before the enemy.

The sentence while it condemns in a most signal manner your conduct, cuts you off from further association in this Squadron with men whose partial endurance of the most trying duties, and whose character for courage, obedience, and subordination have won my highest approvation.

How different has been your course. Scarcely a day on the Station and you disobey orders, arrogate to yourself the duties belonging to a Commander in Chief, talk of opening upon the Town, and of ordering the Troops to advance when you had but one Gun, and not a solitary soldier, and all "for the purpose (as you say) of securing an unmolested entrance of the squadron" into the River. It would be difficult if not impossible to point to another instance of similar folly, and the most charitable construction that can be given to it, is that in the elation of a first command you have truly enjoined yourself actually in command of the Naval and Military

departments then approaching and within a short distance of the scene of your Exploits. With due Respect,

(signed) M. C. PERRY
Commanding Home Squadron.[17]

To Lieut. Charles G. Hunter
U. S. Navy.

The reader will note the concluding expression of this astounding document "with due Respect."

It is not necessary to contend that a navy held in such leash as the irate Perry prescribed would lose all initiative and become practically valueless—nor to hold, had Perry summoned Hunter and after congratulating him upon one of the most gallant deeds in our naval history, had said, "My dear Hunter, don't you think that next time you might leave something for me?" that he would have had in Hunter a passionately devoted subordinate ready to go through fire and water for his chief.

As it was, Hunter was sent home in disgrace, ruined and embittered for life. From the effects of this colossal injustice he never recovered. How indeed could he? The writer believes that much of his subsequent misfortune may be fairly ascribed to the outrageous treatment he received off Alvarado.

AFTER ALVARADO

During the weeks succeeding this tragic episode the newspapers at home printed full accounts of it, for the most part rejoicing in a glorious, an almost unique, victory and condemning Perry in unmeasured terms for his misrepresentations, his unfounded claims to a personal participation and for his shocking punishment of an unusually gallant and energetic subordinate. Some, however, agreed with Perry. One side of the question was typically expressed by the *United States Gazette* of May 7, 1847, which said that "inferior officers must obey the orders of their superiors, under any circumstances of temptation to do otherwise or the efficiency of the navy or army is at an end." For this paragraph the *Gazette* is rebuked by the *New York Commercial Advertiser* in the rejoinder that

the spirit of all instructions was complied with by the very act of going beyond the letter. Nelson thought so; Taylor thought so; though neither of them might have suspected that the delay proposed was for anything but prudence, not for the purpose of transferring laurels. . . . . The Commo-

[17] Emmons collection.

dore rests under the suspicion of having envied the Lieutenant . . . . the little glory of conquering a town, and not allowing him, the Commodore, to come and take the glory of a victory which he had not achieved, for which he was not prepared and of which he should have been willing that some other person should have the glory.

Lieutenant Hunter is the theme of general remark and censure. . . . . A little more of the spirit in the Navy he has displayed would do it no harm and might add much to its efficiency in the present war.

The general sentiment throughout the country was that Hunter was a hero and Perry wholly in the wrong. Nor are Perry's supposed motives spared. The Washington correspondent of the *Philadelphia Ledger*[18] writes:

The reprimand of Lieutenant Hunter by Commodore Perry is, I can assure you, as much commented upon here as in Philadelphia and other places. It is looked upon as extremely ill-natured and wholly unwarranted by the circumstances of the case. Alvarado was, next to Vera Cruz, looked upon as the Gibraltar of Mexico, and the taking of it, with one gun, has turned the whole formidable expedition against it into ridicule. This it is for which Commodore Perry lectured him. . . . He . . . . destroyed all the glory which would have attached to the laying siege to or taking of the place by storm; he accomplished by a *coup de main* what had to be the result of scientific arrangement and execution; and hence his act of unparalleled "folly." Every disobedience of orders, however successful, must be punished, but there is no necessity for dipping the rod in vinegar! That is a luxury which ought not to be indulged in in time of war.

Much indignation also was felt among Hunter's colleagues in the navy who could not be indifferent to this humiliation inflicted as the consequence of dash and courage. So to punish the latter sapped all the springs of naval daring. One officer writes home,

This treatment of as gallant an officer as ever trod deck, for performing as gallant an act as could well be conceived, and with a success which makes his conduct entirely justifiable, will never receive the sanction of President Polk.[19]

Unhappily for Hunter nothing was ever done to right the wrong under which he labored, and the sanguine writer of the foregoing lines wholly misjudged the President.

Hunter was sent home, broken in spirit, to arrive at Norfolk May 25, 1847, a passenger in the U. S. S. *Ohio*.[20] Proceeding thence to New York,

He was received at the American Hotel with cheer after cheer by the enthusiastic crowd which assembled on learning his arrival. The people are

[18] May 19, 1847.
[19] *Pennsylvanian*, May 8, 1847.
[20] *United States Gazette*, May 28, 1847.

always just—they know how to reward a gallant action, and sweep technicalities aside when they interfere with strict justice.[21]

Hunter was indeed the idol of the hour. Escorted to the Governor's room at City Hall by a large concourse of citizens, he was presented with "a costly sword." Dinners were held in his honor, swords were given to him, and he was known as "Alvarado" Hunter to his dying day. A deputation of his fellow townsmen of Trenton received him at the railway and under military escort conducted him to his dwelling, whence in the evening a procession, civic and military, was formed which marched to the court-house where, with appropriate ceremonies, was presented to him a silver pitcher "in testimony of his gallant conduct."[22]

All these manifestations of public favor failed to salve the wound inflicted upon his proud spirit. From the day of his unjust punishment his downfall began to proceed slowly but surely to the end. "Poor Hunter, his fate was a sad one after all. Soon after his arrival at home his friends got him the command of the schooner *Taney* and in her he made a sort of roving cruise in the Mediterranean. He was not allowed a purser, and being extremely careless with his accounts found himself heavily involved upon his return to the United States. His friends came to his assistance and succeeded in getting him another command." So says Parker in his "Recollections." That this shortage involved no moral turpitude on his part and was due to inattention to duties of a novel description may be assumed, since Congress was easily persuaded to make good the deficiency in the government funds placed in his hands.

After a long period on waiting orders he was once more employed afloat. In 1853 he was given the command of the brig *Bainbridge* and sent to join the Brazil squadron under Commodore William D. Salter.

While Hunter's life was marked by many unusual happenings, the last episode is so extraordinary in character that it can only be explained on the ground that his mind had become unbalanced. So far as can be ascertained these are the facts in the case.

A difficulty of some kind had arisen at Asuncion, Paraguay, between the local authorities and the American Consul. Hunter,

[21] *Philadelphia Public Ledger*, May 29, 1847.
[22] Niles' Register, August 14, 1847.

who was nothing if not impetuous, begged Salter to let him go to the scene in the *Bainbridge* and help straighten out the matter. For reasons not given Salter refused the request. Not unlikely he feared that Hunter would be as much out of place in a diplomatic embroglio as a bull in a china shop. Chafing under this rebuff and irritated by Salter's unreadiness to exert pressure where pressure seemed to him needed, Hunter when next sent on a cruise deliberately squared away for home and deserted the squadron, something no really sane man could have done. Arriving at New York early in January, 1855, he issued an address in his defence to the American people.

The defence was characteristic of the man. "Vessels of war," he said, "are sent abroad for the sole purpose of protecting the lives, property and rights of our citizens; and any man who would consent to remain in command of a vessel of war where her use was perverted, *i. e.*, sent where she was not needed when great necessity existed for her elsewhere, would be acting unworthy of his position." [23]

The offence was too flagrant to be condoned and President Pierce ordered his name to be summarily stricken from the rolls. On January 29, 1855, he ceased to be an officer of our navy.[24]

After his dismissal he took up his abode in Philadelphia. The failure of his hopes and his great misfortunes weighed heavily on his mind, his hair became rapidly grey with grief and all his acts betrayed him to be a broken-hearted man.[25]

As might have been expected, he did not long survive his degradation. He was admitted to "The New York Hospital" February 28, 1856, as suffering from a disease contracted in Mexico during the war and there five days later his soul sought and found a peace he had not known on this earth.[26]

He is said to have left a wife and daughter who at the time of his death were in Spain.

The writer, having made earnest but hitherto unsuccessful efforts, will be glad to have from any source information which will enable him to get in touch with Hunter's descendants (if any there be) or with other relatives of his.

[23] *Pennsylvanian*, March 7, 1856.
[24] Navy Department Records.
[25] *Pennsylvanian*, March 7, 1856.
[26] *New York Times*, March 7, 1856.

Hunter's life was full of romance, the tragic element prevailing. It is impossible to review it without experiencing a melancholy regret that so much talent was wasted partly through his own fault, partly through the fault of others. His finer qualities were too fine not to have been better utilized.

In a brief obituary, a writer in the *Pennsylvanian* of March 7, 1856, says that

> no one who knew him had any but feelings of respect for him. His faults, if they were faults, were errors attributable to an impulsive disposition, and were far outweighed by his manly and solid virtues. He was as generous as brave, and impetuous. His melancholy demise will be regretted by all who knew him, as well as by those acquainted with his singular and romantic career.

The highest tribute to his ability is that of his colleague and squadron mate, Lieutenant W. H. Parker, who in his "Recollections" stated that Hunter "was one of the best naval officers of his day." Notwithstanding his faults and errors which were both many and grave, to look upon his end as it really was and to imagine what it might have been, had he not been so shamefully treated by Perry, makes one hope that never again shall such cruelty be inflicted on a gallant sailor, that for all time the one historic victim of unpardonable official injustice in the navy of the United States may still remain the intrepid "Alvarado" Hunter.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE EXECUTIVE OFFICER

By Richard Wane

The executive officer of the *New Mexico* was John Drake. When his orders were issued, there was considerable surprise that so young an officer should receive so important a billet. In fact, Drake himself was quite as much surprised as any one. He had expected to go to the battleship fleet as navigator of one of the ships, or possibly as gunnery officer. That he would be ordered to the very latest ship to go in commission as executive officer had not even entered his mind. As the two-year period of shore duty approached its end, he realized that once more he must break up his household in preparation for a three-year tour of sea duty. As inspection officer at Mare Island Navy Yard, he had become known to even the poorest paid workman as the most exacting man that had ever filled that position. The officers in charge of the manufacturing plants found themselves confronted with more rejected work during the first month of Drake's incumbency than they had had during a year of his predecessor's. There were a good many protests, of course, and a good many arguments, but no end of rejections, in spite of them. Costs mounted up. Also the manufacturing departments became more alert and careful. Then there was better work, costs went down again, workmen were discharged and leading men shifted. The rejections became fewer and fewer. Within a few months, Drake had accomplished a great deal for efficiency's sake, and the efficiency became steadily greater. But it makes enemies to disturb the routine; and while the various department heads recognized that much good had been accomplished, they were not sorry to see Drake go to sea.

The commandant's wife was at home. The veteran of more female wars than the commandant was of real wars, she had now arrived at that enviable social position as the first lady of the

navy yard. She no longer made a first call on new arrivals, for according to the dictates of custom, even newcomers must pay a first call on the commandant's wife. Her afternoons at home were always well attended. Every lady came, unless prevented from so doing by something extremely serious. True, they enjoyed themselves, but it was strategically fatal to absent oneself. Something must be discussed and it was much more comfortable to be present.

Mrs. Green, the constructor's wife, denied herself the refreshment table, a martyr to a new found cause of labor. She sat in a rocker, under a spreading palm, manipulating her knitting needles with intense application.

". . . . eight, nine, ten . . . . Yes, dear . . . . Oh! heavens, I've lost my stitches . . . . one, two, three . . . . yes, they say there is such a shortage of officers for the fleet that they are sending almost any one, even to the most important positions."

Mrs. Drake, nearby, heard the remark, and knowing that it was intended for her ears, would have liked to remark that probably the constructor's shops would welcome a change of inspectors. However, what she did say was, "Are you piping the collar in yellow, Mrs. Green? It's going to look so pretty."

"I'm so glad that you think so, my dear. I was thinking of using white, but, you know, it soils so easily."

All of which has very little to do with the story, except to show that when there are so many people to please, there are some who simply can't be pleased.

When an officer leaves his shore duty, he gives up his house and all that goes with it. His stateroom on board ship, sometimes hardly large enough for one, is supposed to take its place. Such incidentals as one's family have no standing in official circles. There was the packing to do. It would seem that a navy woman would become philosophical after a while and take moving as a matter of fact. But she doesn't. For her, each move has its heartaches, and its fears. In her treasures, each object has its associations and its memories of glorious trips or sordid ones to little boarding houses in the days when her husband's pay was small.

It was hard for Mrs. Drake to take down the first picture. With many a sigh, she gathered them up, and once the shock of the bare walls had passed, she went bravely at her task. Down

came the camel's-hair drapes John had purchased in Colombo, when the battleships had gone around the world. Among her possessions, too, was the cherished set of Canton china—every navy woman but the newest untravelled bride has her set. She wrapped each piece herself and packed it carefully in the very same barrel which had carried it there two years before. The tags from the army transport still stuck to the barrel's sides.

During the packing, the storekeeper's clerk came to check the furniture list, even to the garden hose and the iron ash-bucket.

When Drake came home for his lunch, they ate at a bare table in a still barer room.

"You will have to stay in Vallejo with the children," said Mr. Drake, "that is, until I send for you."

"But," protested Mrs. Drake, "your ship doesn't sail for several months yet, and I thought that we were going with you. It will be so hard to be alone after we have been together for so long."

"I know, dear, but I will have no time for you or the children at first."

His wife knew that if John Drake had decided that she must remain behind, it was useless to try to dissuade him. She had tried it before, but his decisions on domestic matters of major importance had always stood, and, as a matter of fact, had always turned out for the best. So she told him gently that she thought he knew best, and went to the window to hide a tear that would not stay back. Down at the entrance of the channel was the familiar dredger and she wondered idly if she would be able to see it from Vallejo. It was a part of the scenery, working day and night, week in and week out, fighting a draw with the silt of the Sacramento River, that a congressman might say proudly to his constituents, "See I am keeping our payroll intact. You must return me to Congress."

Drake lost weight the first few weeks on the *New Mexico*. Hard work and little sleep made their impression on his face. The ship must be ready to leave the yard at the time set. There were innumerable details to attend to, and new officers to get acquainted with and assigned to duty. A week before the time set for leaving the yard a little man with steel-grey eyes and a close cropped grey mustache came on board carrying a small satchel. To the officer of the deck he announced that he was Captain Smeed and he had come to report for duty and to take

command. His arrival, very indefinite—they understood that he was on leave of absence—had been expected daily. For over a week the morning orders had stated that the officer of the deck would keep a lookout for the captain. The officer on watch had thought at first that he was another of the vast army of solicitors to see the paymaster, but a more experienced officer would have recognized the penetrating gaze of the arrival as too characteristic of the navy to leave any doubts as to his identity.

Drake escorted him to his cabin, and a few minutes later the captain, in uniform, read his orders to command to the assembled crew. With the executive he inspected the ship, asking sharp questions, demanding to know whether this matter had been attended to, whether such a thing had been received on board. The tone of his voice boded ill for a negative reply. Those who knew Captain Smeed said that he was a martinet, and he was known by many. Intolerant of excuses, exacting in the performance of duty, quick tempered and nervous, he was held in fear and respect by those who had served under him. By those above him, he was regarded as a good man for the job.

There was the usual shaking down cruise, during the latter part of which a watch officer forgot to report eight o'clock to the captain. He was suspended from duty, reducing the watch to six. A boat left the ship three minutes behind schedule. The watch was reduced to five. An air of nervous expectancy permeated the wardroom. It got to be a frequent thing for the orderly to come into the messroom at lunch time. The captain wished to see Mr. Drake. When Drake returned to his lunch, the speculation and conversation would cease abruptly, and those nearest him would notice that his face was flushed and tense.

Always a quiet man, Drake would have nothing to say on these occasions. But from day to day his manner changed. The watch officers complained to each other that he supervised their duties with more attention than was necessary. Of an afternoon, after a night watch, when they had tried to take a nap, they were sent for, to be told about something of minor importance. When they had asked for permission to leave the ship they were asked about something or other which delayed their leaving. The paymaster thought that he knew his business pretty well and aired his grievances in the doctor's stateroom. That sage individual advised him to take his troubles to the captain, but after starting for the cabin, the paymaster thought the better of it and whirled about on his heel.

When the gunnery officer had asked for a special boat to take him ashore he was referred to the boat schedule. Down in the junior officers' messroom, the favorite subject was the executive officer. With the freedom of youth, they heaped invectives upon his head, and picked out different jobs for themselves on other ships.

If John Drake knew that he was not popular with the officers of the ship he did not show it. From early morning until after sunset he plodded away in his office or walked about the decks. After lunch or dinner, he would leave the messroom and smoke alone in his stateroom while he worked.

Down in the wardroom, Wadsworth, the senior watch, shook some tobacco violently from a little sack, closed it with his teeth, and spread the tobacco carefully in the hollow of the paper.

"It's a great life if you don't weaken," licking the paper along its length. "Boy, bring me a match! Where is that confounded boy? These boys are the limit. What they need is a few mid watches toeing a seam on the deck. Push the button, Cort."

Some minutes later Antonio Felipes, his black pompadour neatly brushed and highly perfumed, made his appearance.

"What in the blazes makes you so slow? You are not in the bosque eating rice out of banana leaves now, you know. You are in the great American Navy."

"De duktor he send me por his estuard."

"Well, you will be sending por de duktor, if you don't move a little faster," threatened Wadsworth.

"Woody," laughed Cortland, "you are getting irritable. Climate affecting you maybe."

"Climate nothing. My goat is walking abroad in the land."

"I would say that some one had corralled it, had tied it up and was feeding it tin cans."

"I guess you are right, and that some one has got about everyone's goat in his corral too."

"And here you are passing it right down the line. Regular little P. D. L. you are. What is the trouble this time?"

"Mid watch last night and not a bit of sleep before it. Of course I slept like a log this morning and who should pass through the messroom at 8.30 but little bright eyes, who invited my attention to the fact that the tables had to be cleared by 8.30 and would

I please arrange to get my breakfast more promptly in the future. Oh, this is the life!"

"Shouldn't let a little thing like that bother you. We are all getting it. Why last night, I, Lieutenant Cornelius Cortland, junior grade—for all time I guess—late commanding officer of the U. S. S. *Pampanga,* senior officer present, Southern Archipelago, was told to wear my cap, when I ventured on deck to the movies without it. How have the mighty fallen!"

"And I, Lieutenant Squirt McDougal," chirped up a little fellow in the corner, "lately detached from my soft job at the navy school on the Spa, with the rest of the mob—I, the mighty Squirt, famous shortstop on the Plebe baseball team, I got mine too."

"And what did the little runt do?" gleefully enquired Wadsworth.

"The little runt as you choose to call him, you ragged beanpole, was three minutes late in reporting his division this morning. Naughty! Naughty!" and he slapped his wrist derisively.

There was some comfort, at any rate, in knowing that the other fellow had received his share of attention; and, besides, talking things over with the other victims soothes the hurts to one's pride.

Of the captain they saw but little. At mast in the morning, he would fix his eye-glasses slowly to his nose, and with his head bent over the report book, he would gaze over the top of his glasses at the sailorman up for trial. After repeating the man's explanations with understanding and sympathy, to the complete satisfaction of that person, and be it said to his complete deception, he would snap out that he did not believe a word the man had said, and deliver upon him a punishment that made even the reporting officer wince at its severity.

At the first battle practice of the ship, the officers did their work through no desire to augment the fame of their captain, or add to the laurels, if there were any, of their executive officer. Relentlessly drilled and trained, they went to their stations on the day of the practice determined to do their best, because that was the way every officer of the navy was supposed to do his duty. As a matter of fact, they were not very optimistic over the outcome. For the most part, censure had been their portion and praise had not been known. The executive had that morning

told them that their men were not scrubbing their hammocks properly. And this on the day of target practice!

After the firing was over, it was whispered that the executive had stood behind the captain and when the latter had given the order to commence firing had quietly asked him to cancel the order. So surprised was the captain, that he did so, demanding to know the reason. Drake explained to him that under the rules, he did not have to fire until the ship had closed in another thousand yards and that he thought that the captain had known. Whether it was the thousand yards, or not—it certainly must have helped—there were 12 counted hits radioed from the towing ship. The captain tried to be affable, but he did so with difficulty. Certainly he was pleased, for this was undoubtedly the best shooting that had been done, with only three ships yet to fire. As for Drake, he sat down to lunch with his acquired reserve, and answered with monosyllables to the conversation of those about him.

For a new ship the *New Mexico* had done exceptionally well, and the captain knew that he would be among those present when the Selection Board next met. He offered his boat to the officers if they wished to go swimming, and warned several men at the mast instead of punishing them—something of a novelty to the men. It was noted that his orderly of late seldom appeared in the wardroom at lunch with the quiet summons. And it was noted that the executive appeared on deck less often to ask the officer on watch why he had not attended to some matter with more attention to detail. But for the most part he kept to himself, smoking more than he should have, talking to no one except on matters pertaining to duty. He understood in a vague sort of way that the officers regarded him in an unfriendly light.

There came an end to the drills and the maneuvers. It was over—all the hard work of the winter months in Cuba. The next day the fleet would sail for the north. Boats were secured for sea, gun shutters closed and all but one gangway taken in.

As Drake stood looking towards the shore line, the thought of his family awaiting him in the states caused his face to relax. The pleasure of anticipation was not to be denied him. To-morrow they would be at sea, and Fisherman's Point over there would be lost in the distance. The cable station with its lonely little family of three would be no longer under the big guns of the fleet.

As he gazed in that direction, a motor boat put off from the shore, and made for the gangway of the *New Mexico*. In the boat Drake recognized the superintendent of the station and his wife. With them was a lad of eight, and he noticed when they came on board that both the little fellow and his mother had been crying. He met them at the gangway, and in a few words was told by the father that the admiral had authorized the lad's passage to the states where he was to be placed in school under the care of an aunt. Drake looked over the permit and told them quietly that he would see that the boy was made comfortable on the trip.

The little fellow clung to his mother and manfully tried to hold back the big tears which filled his eyes. The mother gathered him in her arms and cried softly. The father, too, was filled with emotion as he said good-bye to his son.

"It's for the boy's good, mother, so you must not take it so hard." Turning to John Drake, who was gazing over the side, but seeing nothing, he said, "I trust, sir, that you will be kind to my boy. He will miss his mother very much and will be very lonesome."

"I shall do my best for the lad," Drake answered, and turning to the mother, "I have two boys at home, one about his age, and you may rest assured that he will be well taken care of."

With a final embrace the mother and father went down the gangway and into the little boat. Waving their hands as long as they could be seen, they looked longingly at the big ship that was taking their son so far away from them. They saw John Drake at the head of the gangway, the little fellow's hand clasped tightly in his, both waving their farewells to the little boat until it passed from view.

"Now let's take a look at the big guns," said Drake, "and by the way, what is your name?"

"John," answered the boy simply.

"Well now, isn't that splendid? That is my name, too. I think it's a pretty good name, don't you, John?"

The boy swallowed a big lump in his throat that would not stay down, and dashed a tear quickly from his eyes.

"Yes, sir."

"Short names are best, you know. Then the boys can't give you nicknames. Now when I was a little fellow like you . . . . "

"But my daddy says I am a big boy now," objected the boy.

"Why of course you are. But what I meant was that I was littler than you are when I was little. See?"

"Yes, sir."

"Well when I was little there was a boy who lived near me, whose name was Sylvester. The other boys called him Sylvest at first and then they called him Syl. One day one of the boys called him Silly and that was the only name he was ever called after that."

The little boy laughed and said he thought that Silly must be a very funny name to have when one grew up. The tears disappeared, and the natural interest of a child in new surroundings asserted itself. He asked a great number of questions which John Drake carefully answered. Hand in hand, they walked the deck, the boy talking with animation, Drake smiling and talking quietly to the lad.

"This is to be your home for the next few days, John," he told him, as they entered the executive's stateroom. "We will just take all of those things out of the top drawer now and put your things in there. How will that be?"

"That will be fine, sir, and Oh! look at the elephants," spying a herd of ebony elephants on the desk top. There was a very large one and a very small one and many sized ones between these two. Drake took them down, one by one, and gave them to the boy, who promptly sat on the deck and stood them in a row.

"And here is a camel to join the herd. But first I must wash the ink out of him."

"Do camels have ink in them?"

"Just this one. He was made to hold ink. All the real camels are full of water."

"Tell me about them, please," promptly demanded little John.

So John Drake sat on the edge of his bed and told the child all about camels and deserts and caravans. It was a long story, and when it was finished, the child asked to be told all about elephants. So Drake told him a tale of elephants and jungles that held the child in spellbound interest.

Over their cigars and their pipes, after dinner that evening, the wardroom officers talked of their plans for New York. Blue drifts of tobacco smoke floated over the messroom; the pianola pounded forth a syncopated Broadway hit; over in the corner, the doctor pondered over a chess board with the paymaster;

while at the other end of the table the chief engineer, with a pack of cards spread over the table, played his nightly game of solitaire.

At one end of the messroom, a Filipino boy spread clean sheets over a transom, folded the blanket on the foot and beat out a pillow.

"Better put some chairs alongside that transom," suggested the paymaster, "the boy might roll out."

But after the lights were out, John Drake came from his room in kimono and sandals and retired on the transom. Each night at sea he slept there, and when it was rough, he placed the chairs against the sides of the narrow transom to prevent his rolling out. On occasions, when the rough weather would awaken him he would go to his stateroom to take a look at the little boy lying asleep in the big brass bed.

Wadsworth went to the executive's stateroom to make a report the day before their arrival in New York. He looked through the partly opened curtain and saw the boy sitting on the deck, building a house with wooden blocks, which Drake had asked the carpenter to make. Close to him, on his knees, was John Drake, handing the blocks one by one to the child. Both were laughing, for the boy was having great fun.

"I don't want to go to school, Mr. Drake. I would like to stay right on here and be a sailor. Do I have to go to school? Why can't I stay right here with you? We could have so much fun. I would like to be on a ship with you all the time."

Drake looked at the boy and asked, half to himself, "Would you, John? I wish that others felt the same about it. But I guess they don't understand."

Wadsworth did not deliver his report. Instead, he turned quietly about and tiptoed down the ladder to the wardroom.

"You fellows, come over here a minute, I want to tell you something." When they had gathered about him, he talked earnestly to them for a long while and when he had finished they nodded their heads in assent.

"Woody, I guess you are right, we have considerable parallax in our visions and it has been getting worse. Our opinions need boresighting, too, I guess," said Cortland, in the vernacular of the navy.

When they sat down to dinner that night, with the little boy in his usual place next to Drake, there was less conversation than

usual. As the officers ate, they cast an occasional, expectant glance towards the center of the table. Presently Wadsworth tapped his fork against his water glass several times. A silence settled over the messroom.

Again he tapped the glass with his fork. "Ah-h-h," he sang.

"Ah-h-h," chorused the officers in the same pitch.

Then Wadsworth started singing and the others followed, until every voice had joined the chorus. Away down in the junior officer's mess and even in the captain's cabin above the words of the song could be heard:

With a neat Ha Ha, sweet Ha Ha,
Handsome and fair.
He is a corker, the girls all declare.
He's a high rolling lollydob swell.
Here's to JOHN DRAKE!
Say DON'T he look well?

The song had died down. At the end of the table sat John Drake, a great look of bewilderment on his face. Recovering his surprise, he smiled. It was a smile of great peace and happiness. He was amongst friends again. They understood.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE CAREER OF THE MEXICAN GUNBOAT *TAMPICO* [1]

By J. H. KLEIN, JR.

THE MUTINY

At the beginning of the year 1914 there were three Mexican gunboats on the west coast of Mexico, namely, the *Guerrero, Morelos* and *Tampico,* all under Federal control.

On February 22, 1914 (Sunday), at Guaymas, Mexico, about 8 p. m., while about half the officers and men were ashore, the executive officer (Lieutenant Malpica), the paymaster (Rebatet), and two engineer officers (Johnson and Estrada) took charge of the crew of the *Tampico,* arrested the captain and the chief engineer, and announced that the *Tampico* would henceforth be under the control of the Constitutionalists, or Rebels. The captain and the chief engineer were told that if they made no resistance they would not be harmed, and would, at the first opportunity, be turned over to the Federals. The mutiny, therefore, was accomplished without violence or bloodshed.

The *Tampico* immediately left Guaymas and stood to the northward intending to ram the *Guerrero.* Fortunately for the *Guerrero,* the *Tampico's* steering gear broke down and she then turned around to the southward and proceeded to Topolobampo, arriving there on February 24. The captain and the chief engineer were then placed aboard the S. S. *Herrerias,* and sent to Mazatlan, which at that time was in Federal hands.

[1] Nothing has heretofore been written concerning the career of the *Tampico* except the official reports from vessels stationed on the western Mexican coast at that time. It was my intention at first to compile an official report of her operations, but the tale seemed so interesting that the "compilation" gradually became a "story." The official reports of Admiral T. B. Howard (commander-in-chief), Commander G. B. Bradshaw (commanding *Yorktown*), and Commander N. E. Irwin (commanding *New Orleans*) were consulted and the data derived therefrom were used in producing the following story which is of historical value because of its accuracy.

The exact cause of the mutiny is not known. Various vague stories have been circulated concerning the true reasons therefor, but no one seems to know which, if any, of these may be true. One story has it that the Federals owed the crew 4000 pesos. Another story was told to the effect that Malpica had strutted the streets of Guaymas with a lady of questionable character (some say she was the captain's mistress) and as a punishment the captain sentenced Malpica to be reprimanded and to perform temporary duty with the army at the front. In order to avoid this sentence he was said to have hatched out the mutiny. By common repute the *Tampico* had been a very "gay" ship in her day, and I was told that frequently week-end parties had taken place at which both sexes were present aboard ship for several days at a time.

OPERATIONS AT TOPOLOBAMPO

On March 2, 7 a. m., the *Guerrero,* commanded by Capitán de Navío Torres, arrived off Topolobampo from Guaymas, and anchored outside the bar. At 10.30 a. m. the next day the *Morelos* arrived from Mazatlan, and anchored near the *Guerrero.*

At 9.37 a. m., March 4, the *Tampico* was observed standing down from Topolobampo. The *Guerrero* immediately got under way and opened fire as she entered the channel. The *Morelos* got under way as soon as practicable and followed along astern of the *Guerrero.* As soon as the *Tampico* cleared Shell Point she returned the *Guerrero's* fire, whereupon the *Guerrero* stopped, backed out of the channel, and presented her broadside to the *Tampico.* At that time the *Morelos* was about 800 yards beyond the *Guerrero* away from the *Tampico.* The firing continued until 10.05 a. m., during which time the *Guerrero* fired about 20 shells, the *Morelos* about six, and the *Tampico* 14, at a range of 8000-9000 yards. The firing of the *Guerrero* and of the *Morelos* was very wild. Comparatively speaking, the *Tampico* fired fairly well. Of her shots one was spotted 50 yards short, one 50 yards over, and one slightly to the left. At the conclusion of this brief engagement, the *Tampico* returned to Topolobampo and the *Guerrero* and the *Morelos* anchored outside, off the bar. No damage was done to any of the vessels. At that time the *Tampico* was said to have had about 70 tons of coal and about eight hundred 4-inch shells remaining on hand. At 8.40 p. m. the same day the *Morelos* left for Guaymas to coal and provision, returning to Topolobampo on March 9.

On March 13, at 8.50 a. m., the *Tampico* again stood out; the *Guerrero* and *Morelos* getting under way as soon as possible. The *Guerrero* opened fire at 9 o'clock. As soon as the *Tampico* cleared Shell Point, she opened fire on the *Morelos,* her first shell landing about 20 yards short, range 9000-10,000 yards. The *Morelos* returned the fire and began retreating to the southwestward, on which course she would have put the U. S. S. *New Orleans* in direct line of fire between herself and the *Tampico.* The *Tampico* then shifted her fire to the *Guerrero* and the *Guerrero* adopted the tactics of the *Morelos.* The *New Orleans,* of course, shifted berth as soon as possible. All firing ceased at 9.12, the *Guerrero* having fired 13 shells, the *Morelos* nine, and the *Tampico* six, at a range of 9000-10,000 yards, and no hits were made. It was again noted, however, that the gunnery of the *Tampico* was considerably better than that of either the *Guerrero* or the *Morelos.* The *Tampico* returned to Topolobampo while the *Guerrero* and *Morelos* anchored outside of the bar considerably to the southward of their previous anchorage. The *Morelos* left for Altata on March 30.

At 4.32 p. m. on March 31, the *Tampico* was again reported standing out. The commanding officer of the *Guerrero,* who was at that time returning an official call on the captain of the American cruiser, quickly returned to the *Guerrero* and got her under way immediately. The *Guerrero* took up a position off the channel broadside toward the *Tampico.* About 5.30 p. m., when the *Tampico* had reached a position abreast Shell Point, she opened fire on the *Guerrero* at a range of 9000 yards, and was immediately answered. About 6 p. m. the *Tampico* headed straight for the *Guerrero,* going right on over the bar until she grounded below the entrance. By 6.15 she managed to get off the bar and headed northwest, straight for the *Guerrero.* The *Guerrero* retreated but continued firing. At 6.30 the *Tampico* came about and headed back toward the harbor. Both vessels ceased firing at 6.40 because of darkness, the *Guerrero* anchoring off the bar while the *Tampico* proceeded on inside above Shell Point. During this engagement the *Tampico* fired both her 4-inch guns and one 6-pounder, while the *Guerrero* used her six 4-inch. The firing on both sides was very wild. The range varied from 9000 to 2000 yards. The *Tampico* fired about 160 shells (4-inch and 6-pounder) and the *Guerrero* fired 162 4-inch shells, of which 20 were shrapnel and the rest armor-piercing. Malpica later on told one of our officers

that the *Tampico* had been hit seven times during this fight, as follows: Two 4-inch shells passed through the officers' quarters under the poop, one 4-inch shell hit amidships near the water-line, four 4-inch shells entered the bow, one of which struck below the water-line and the other three hit near the water-line. There were no injuries to her personnel. The hits were stated by Malpica to have been made during the period while the *Tampico* was swinging around on the bar. Later on it was discovered that the *Tampico* had sunk inside the channel above Shell Point. The *Guerrero* was struck three times during this engagement; one 4-inch shell, armor-piercing, entered the starboard side of the berth-deck but did not explode, one 6-pounder landed on the skid frames amidships but did not explode, while another shell, either a 4-inch or a 6-pounder, cut a stanchion on the bridge. None of the crew on the *Guerrero* were killed, but a few suffered minor injuries. On April 10 one of our officers inspected the *Tampico* and reported that she was aground, heading out, inside Shell Point on the south side of the channel with water covering her entire main-deck. The two 4-inch guns were still aboard as was one of the 6-pounders in the waist, all the other guns having been sent ashore for use with the army. She still had 600 rounds of 4-inch ammunition left, most of which was under water.

On April 2, during the forenoon, the *Morelos* returned from Altata. The Federal gunboats did not know, but they shrewdly suspected, that the *Tampico* was aground, so, in order to find out, the *Morelos* was sent in close to the bar. At a range of 8000 yards she fired 11 shells at the *Tampico* and the *Tampico* fired eight in return, with no damage on either side.

On April 9 an aeroplane came out of Topolobampo and dropped five bombs near the *Guerrero* and *Morelos,* one of which fell close to the *Guerrero.* Small-arms were used in an endeavor to drive off the aeroplane, but because of her height this fire was not effective.

Later on in the month the Federal gunboats, having discovered the true situation of the *Tampico,* withdrew to other ports.

The *Morelos,* while in Mazatlan harbor, attempted to run well up into the inner harbor, and in doing so, ran high and dry aground. There she lay between the besieged Federals within the town and the Rebel besiegers around the outskirts until she was completely shot-up and destroyed by *both* sides.

The *Guerrero,* in the meantime, steamed up and down the coast between Guaymas and Mazatlan wherever she was needed.

The officers of the *Tampico* were making every endeavor to raise the ship, and put her in serviceable condition. A diving suit was finally procured, the holes under water plugged up, and eventually the ship was raised.

EVENTS PRIOR TO THE FINAL BATTLE

On June 11, 1914, the *Tampico* was reported as having been raised and made ready for sea. The commander-in-chief of the Pacific fleet (Admiral Thomas B. Howard, U. S. N.) was then off Mazatlan in his flagship *California* (now the *San Diego*). Several destroyers were kept with the flagship ready for dispatch duty. On Sunday, June 14, 1914, he received a report that the *Tampico* had that day sailed from Topolobampo. Fortunately for me, my boat (the *Preble*) was ready for a run, so I was detailed to find the *Tampico* at sea and then trail her. The *Preble* immediately got under way (about 3.30 p. m.) from Mazatlan, and started northward toward Topolobampo. The destroyer *Perry,* then at La Paz, was ordered to head for Topolobampo and report by radio to the *Preble* for further instructions. As I did not know what course or speed the *Tampico* was making, I simply proceeded slowly (about 10 knots) overnight to Topolobampo in the hopes of sighting her about daylight the next morning. During the night I twice headed to the westward to investigate passing ships. This set me about 10 miles to the westward of my original course. About 7.30 a. m., June 15, another ship was sighted on the port beam (to westward), hull down, and masts hardly visible. This vessel finally proved to be the *Tampico* herself. Had I not been set to the westward in looking over the two steamers during the night I would not have had the good luck to find the *Tampico* so quickly. Her position then was Lat. 25° 14′ North, and Long. 109° 07′ West.

I approached to within about two miles of her, and stopped. She also had stopped. As she did not get under way I approached to a position about a mile abeam of her in order to get a closer view, when I saw her lower a boat which headed toward the *Preble.*

The officer in charge of the boat (Rebatet) came aboard, presented the compliments of his commanding officer, and told me the following tale:

The *Tampico* had been under water about two months; she was raised, and thought to be ready for sea. On Sunday, June 14, she left Topolobampo under one boiler and proceeded to sea en route to Altata, Mexico. There she expected to retube her boilers and improve the condition of her machinery, and then start out after the *Guerrero*. After destroying the *Guerrero* she would break up the commerce on the west coast of Mexico, and, by cutting off the supply of provisions at Guaymas and Mazatlan would cause these two main Federal strongholds to fall into Rebel hands. The *Tampico* had proceeded only about 30 miles to sea when her one remaining boiler had burned out and she was now temporarily helpless. He thought repairs could be made, and that by sunset the *Tampico* would again be on her way to Altata. Her complement at that time consisted of the officers mentioned above, the following three additional machinists (Filiberta Vela, Porfirio Gonzales and Floreus Araryo), and about 56 men.

After Rebatet had returned to his ship I withdrew to a position about two miles to the northwestward of the *Tampico,* hove-to to await further developments, and sent a radiocode to the commander-in-chief informing him that I had found the *Tampico.* About 1 p. m. the destroyer *Perry* came in sight, received instructions, and also hove-to.

About 3 p. m. another boat put out from the *Tampico* and came to the *Preble.* The chief engineer (Johnson) and his senior assistant (Estrada) came aboard. They seemed to be in great distress and told me a tale as follows:

They could not repair their boilers; therefore they were at the mercy of the elements and would gradually drift ashore. They requested me to tow them to Altata—about 80 miles distant. (I declined on the grounds of strict neutrality.) They then begged me to send a radio to the American admiral, quoting their request. The captain of the *Tampico* had requested that I come aboard to see him.

I sent the radio to the commander-in-chief as they requested. When I showed them the rough draft of the message in radiocode they were very pleased because they had feared that I might send the message in plain English and that the *Guerrero* would pick it up and discover how helpless they were. And as they could not understand the message, they were certain that the *Guerrero* could not.

About 5.30 p. m. I boarded the *Tampico.* Captain Malpica excused himself for not having called, pointing to the bandages on his left foot. It seemed that about two weeks previously he had accidentally discharged his revolver into his foot, and as a result he could barely hobble about. During my conversation with him I gained a very favorable impression of his ability and determina-

tion. He spoke a little English, and, with my poor scraps of Spanish, we managed to piece out a very fair conversation. He seemed very grateful for my having forwarded his request for a tow to the commander-in-chief, and was anxious for me to inspect his ship thoroughly, to see for myself in what a pitiful condition she was. Accompanied by the executive and the chief engineer, I inspected the ship from truck to keel.

I was most anxious to see her, but as the inspection progressed I became more and more depressed. It was impossible to see such a helpless vessel, completely at the mercy of the wind and sea, totally unfit to steam or remain afloat, much less to commence the unequal struggle with the *Guerrero* which was imminent and inevitable, without a feeling of pity for these poor fellows. Above all, I could not suppress a feeling of admiration for this brave man, which increased at the end of the inspection, when upon asking Malpica what he would do if the *Guerrero* appeared, he defiantly answered: "I'll fight her and sink her if she will only come within range of my guns." These words could only come from either a fanatic or a remarkably determined man.

Conditions aboard that ship cannot be properly expressed in words. The captain's cabin was littered with boxes of stores, provisions and small-arm ammunition. These cases looked as if they had been thrown aboard from a great height and then left scattered, bulged and broken as they fell. The furniture was dilapidated and musty. A steel safe and two magnificent brass candelabra stood among the broken cases. A large quantity of alcohol was said to have been stowed beneath the captain's cabin. The officers' quarters were in the same sad condition.

Out on the main-deck was strewn every imaginable variety of splinter-producing litter. Broken cases, bales of hay, ammunition boxes, and Lord only knows what not scattered all about. Among it all, three cows sauntered aimlessly around assisting in messing up the decks.

Four 6-pounder semi-automatic guns had originally been installed in the waist. All these guns were now missing, and only the broken pedestals remained.

On the skid-beams overhead were the pulling boats which were a long way from being seaworthy or clean. The radio shack, a wooden house about 5′ by 5′ by 8′, was also mounted overhead between the boats. The ship carried an aerial, but there were no radio instruments aboard. Had a shell exploded among these

boats the fragments and splinters would have killed or injured every one on the main-deck. The bridge was a small, rickety affair. On the port side a small machine gun had been temporarily mounted. About 30 boxes containing the loaded belts for this gun were piled about on the bridge.

The *Tampico* had a raised deck forward and aft, on each of which was mounted a 4-inch rapid-fire gun. The officers said that these guns were unreliable, and that they expected trouble with them. A casual examination showed that the breech blocks were loose on their hinges, the rifling badly eroded, and that there was much lost motion in the training and elevating gear. The sights were of a very antique design. Not only did they have much lost motion, but the cross-wires in the rear sight could not be brought to coincide with the front sighting notch. In my opinion these guns were more dangerous to their own crews than to the enemy.

Ammunition was scattered all about the forecastle and poop. Some of the shells were lying out exposed to the weather and some were still in their boxes. Shrapnel, blind shell, and armor-piercing shell were mixed promiscuously, although there seemed to be more shrapnel than any of the other. As this ammunition had been under water for two months I had grave doubts as to whether it could be fired at all, much less with any degree of accuracy. I was told that they had but 100 rounds of 4-inch shell of all kinds in the entire ship. Inside the forecastle on the main-deck level were two 6-pounder semi-automatic guns. These seemed to be in fair condition and had an unlimited supply of ammunition. (Only one of these guns could be used in the battle next day as the *Guerrero* did not steam over on the port side of the *Tampico*.)

Below decks the same disorder and dirt was in evidence. Broken wooden fittings were piled up in all corners, a fine opportunity for fire in action. The old shot holes which had been received in previous engagements were plugged up with makeshift leak-stoppers. The officers stated, however, that she was dry and water-tight.

The engine-room was indeed a sorry spectacle. Everything seemed to be rusty and out of commission. The main engines themselves were rusty and filthy, but they had succeeded in going about 30 miles with them at very slow speed. The generator was hopelessly ruined by the salt water, so they had neither electric power nor lights, except kerosene lanterns. Several pumps were said to be in fair condition. The ice-machine was not working.

but of that they had little concern at this time. The evaporator, they said, could be used if they could only get steam from the boilers.

The two Babcock and Wilcox boilers were dead, the fronts of the casings were off, hand-hole plates removed, and many tubes exposed to view. Salt crystals hung from the tubes, the steam piping, the fresh-water piping, and gauge glasses. According to the chief engineer about 500 tubes needed plugging. They were using wooden table legs to make these plugs. Several firemen while hoisting ashes were singing away as if they were really happy. The executive told me that the engineer officers had been in the fire-rooms constantly to tend the steaming boiler, but that during the temporary absence of one of them, the inexperienced firemen had carelessly ruined the boiler. This defection on the part of the engineers was evidently one of the bones of contention aboard the ship, and caused the reprimand of which I shall tell later. The executive said that the engineers' force was composed of five engineer officers and 15 "shovelers" (as he expressed it). It seems that they had no artificers, machinists'-mates, oilers, or water-tenders, and that the "shovelers" were very inexperienced.

The crew were a hard-looking lot of Mexicans. They seemed to be but poorly disciplined, if at all, as during the inspection they swarmed about and would not give gangway to the officers until spoken to very sharply. One of them in fact lolled in a broken-down armchair on the starboard side of the quarterdeck, smoking a cigarette in a most nonchalant manner. Many of the crew wore bandages—evidences of previous engagements. They were poorly clothed, some of them wearing hardly any clothes at all. Inquiries among the various officers as to the number of men in the crew brought answers ranging from 38 to 56. It seems none of them knew exactly how many men were aboard. By checking up the prisoners and wounded I estimated that the crew consisted of:

1 commanding officer,
1 executive,
1 chief engineer,
1 assistant engineer,
3 machinists,
15 in engineers' force,
14 in seaman branch,
25 soldiers.

61 total.

After finishing the inspection, I had another conversation with the captain in his cabin. He seemed anxious for a reply to my radio in regard to towing him to Altata, and was disappointed when I told him that I hardly expected one before daylight. Before I left he insisted that I have a drink with him of the vilest liquor I have ever tasted. He seemed loath to have me go, and made me promise that I would come aboard at noon the next day to sample a cocktail for which he claimed exceptional virtues. (The poor man had crossed the line by noon the next day.) I inquired about his supply of food and water and he told me that he could hold out for at least two weeks.

During the night all the vessels drifted in various directions. The *Perry* and *Preble* took position to the westward of the *Tampico* so that in case of any grounding the *Tampico* would ground first and give us a chance to clear out.

About 10 p. m. we sighted a vessel approaching from the southward. She steamed to within two miles of us and then sheered off to the westward. She was probably some coastwise trading vessel, but of this I am not positive. The three ships must have presented a very queer appearance. The *Tampico* was burning several dim oil lamps which could hardly be made out at a distance of one mile. The *Perry* and *Preble* had their running lights on and also the white masthead lights. In addition, being under way, but stopped, we had our red speed-indicator lights on the foremasts burning. A merchantman on coming upon such a combination of lights in a place usually and supposedly clear of all ships, lights, etc., must certainly have been surprised, and I cannot blame her for making a sudden change of course to westward in order to give us a wide berth.

During the night we intercepted a radio from the *New Orleans* (then south of Guaymas) to the commander-in-chief, stating that the *New Orleans* was trailing the *Guerrero* on a southerly course. From her 8 p. m. position I figured that the *New Orleans* and the *Guerrero* would pass us about 7 a. m. the next day. To my mind that information sealed the *Tampico's* fate. We, on the *Preble,* discussed the impending battle, and I am sure none of us slept very soundly during the night. It was a very peculiar feeling to know that the *Guerrero* was bearing down on the helpless *Tampico,* and yet we were unable to inform the *Tampico* of the surprise in store for her. However, my orders were to watch and wait and to report everything, but to assist neither side.

Some time during the night the *Tampico* drifted over a 22-fathom shoal and dropped both her anchors. Her position on anchoring was Lat. 25° 28′ 30″ North, Long. 109° 18′ West, and it was there in that position that she was sunk.

About daylight the next morning, June 16, we sighted two vessels to the northward bearing down on us very rapidly. About 5.30 they were recognized as the *Guerrero* and the U. S. S. *New Orleans* (Commander Noble E. Irwin, U. S. N., commanding). The *Guerrero* stopped and cleared for action, and about 7 a. m. stood down toward the *Tampico* to commence the fight.

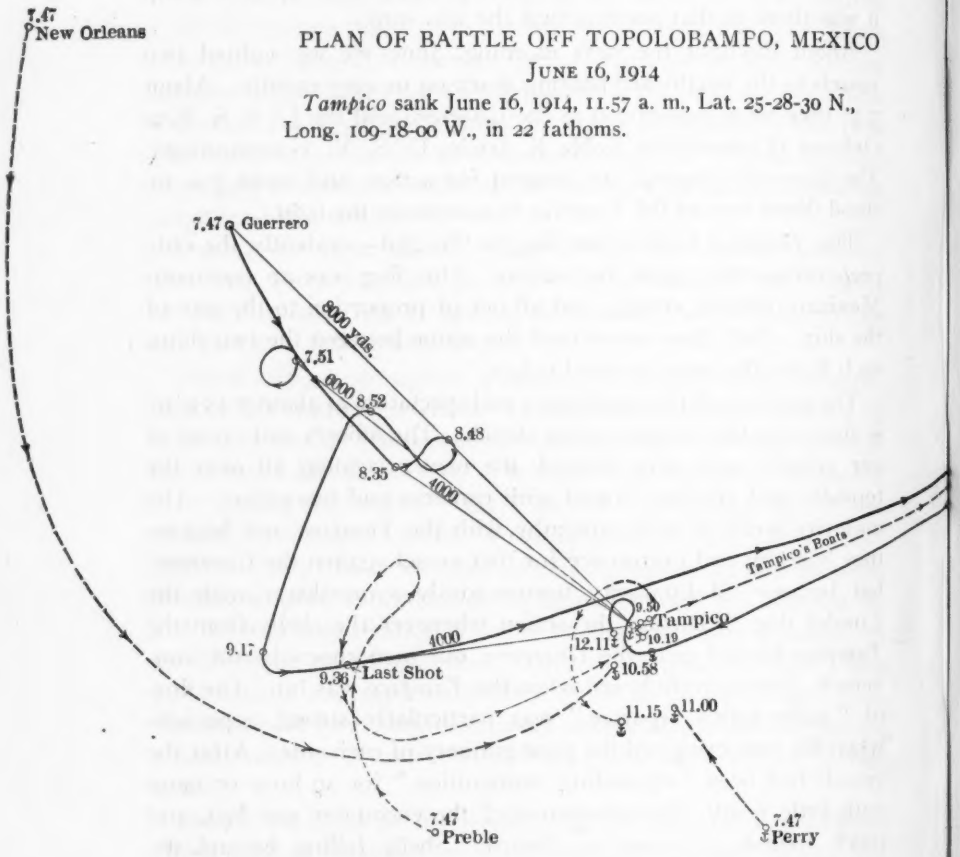
The *Tampico* hoisted her flag to the gaff—evidently the only preparation they made for action. This flag was an enormous Mexican national ensign, and all out of proportion to the size of the ship. And then commenced the action between the two ships, each flying the *same* national colors.

The position of the combatants and spectators at about 7.45 a. m. is shown on the accompanying sketch. The officers and crews of our vessels were very excited, the men swarming all over the topsides and rigging, armed with cameras and binoculars. The majority were in deep sympathy with the *Tampico,* not because they had any real preference for that vessel against the *Guerrero,* but because all humanity unconsciously sympathizes with the "under dog." During the action whenever the shells from the *Tampico* landed near the *Guerrero,* our men cheered, and, conversely, groans were heard when the *Tampico* was hit. The flow of "sailor-man's repartee" was particularly strong, especially when the men criticized the poor gunnery of each side. After the vessels had been "expending ammunition" for an hour or more with little result, the seriousness of the encounter was lost, and much foolish comment was heard. Shells falling beyond the target were called "home runs" while those striking closer were called "triples," etc. On one occasion, when one of the *Tampico's* shells fell about one-third of the way to the *Guerrero,* the helmsman leaned over to the quartermaster and said, "Gee, that wasn't even a respectable bunt," to which the quartermaster replied, "Those boobs on the *Tampico* will starve to death before the *Guerrero* hits her." During the battle the *Preble* ran back and forth midway between the two firing ships, at right angles to the line of fire, and about two miles clear. Whenever the *Guerrero* came about we did likewise, following each of her movements, but being from one to two miles south of her, we interfered in no way.

The weather was ideal, clear and warm, with just sufficient breeze to blow the smoke clear of the guns. The sea was almost dead calm.

PLAN OF BATTLE OFF TOPOLOBAMPO, MEXICO
JUNE 16, 1914

Tampico sank June 16, 1914, 11.57 a. m., Lat. 25-28-30 N., Long. 109-18-00 W., in 22 fathoms.



In order that my impressions of the battle would not later on become confused, I had a yeoman stand near me with a stopwatch, pad and pencil and jot down all the steps of the engagement (I dictated to him as they occurred), noting the time of each event. In this way "imagination" was eliminated.

THE FINAL BATTLE

True to his word, Malpica was the first to begin the engagement, firing his after 4-inch gun at 7.47 a. m. (Mazatlan time) at a range of about 8000 yards. This shell fell 400 yards short. The *Guer-*

rero promptly answered with one gun, the shell falling 1000 yards over. By 7.50 the engagement had become general. The *Guerrero* was using all of her 4-inch guns, while the *Tampico* could use only her two 4-inch and the starboard 6-pounder. Whether the *Tampico* ever fired her machine gun or not is questionable, as the range was never reduced sufficiently to enable the machine gun to reach the *Guerrero*. The firing on both sides was very erratic. There seemed to be no attempt made at spotting. At 7.51 the range was reduced slightly and the *Guerrero* changed course to starboard, *i. e.*, away from the enemy. At 8.02 the *Guerrero* stopped temporarily, the starboard battery presented to the *Tampico*, range estimated about 6000 yards. Between then and 8.11 the firing was very poor. Neither ship had as yet made any hits. Some of the *Tampico's* shells were falling about half way to the *Guerrero*, this no doubt being due either to the defective, wet ammunition or to the failure of the elevating gear. (See story of men, noted near the end of paper.)

At 8.13 both vessels ceased firing for three full minutes, and then the *Tampico* opened again. It was at this time that we noted the manner in which the *Tampico's* guns were being served. It seemed to us that the gun's crew would load the gun and lay it in the general direction of the enemy. Then the men would back away from the gun and lie down flat on deck while some one pulled the firing lanyard. I do not believe that any attempt was made to keep the guns continuously on the target while firing. One officer on the *Preble* stated that he had observed the same procedure on the *Guerrero*, but I saw at various times the pointer at the gun when the *Guerrero's* guns were fired.

At 8.20 the *Guerrero* came about, presenting her port broadside to the enemy. Firing was speeded up, but all shells were falling short. Evidently when they changed course away from the enemy, thereby increasing the range, they failed to change the setting of the sights. About 8.22 the *Guerrero* began easing toward the *Tampico* very slowly and at 8.24 made her first hit—after 30 minutes of firing. This shell struck the main-deck between the mainmast and the poop. A large cloud of white smoke arose, but no damage seemed to have been inflicted, and, as there were no guns in that part of the ship, the *Tampico* did not suffer any reduction of gunfire thereby. This shell was evidently a shrapnel. (Later on I was told that the *Guerrero* had fired practically all shrapnel throughout the engagement.) Firing continued as before, *i. e.*, very slow, and correspondingly ineffective.

Before the fight the *Tampico* had lowered all her boats and had secured them to her port lower boom on the unengaged side. At 8.34 one of these boats got adrift and floated clear of the ship.

At 8.35 the *Guerrero* had advanced to a range of about 4000 yards and then changed course to port, *i. e.,* away from the *Tampico.* This period marks the least range of the entire two hours of fighting. It is probable that at this stage the *Guerrero* was struck. We discovered later that she had been hit twice during the engagement, but as neither hit did any damage we did not know at exactly what time they were made. The *Guerrero* came about at 8.40 and headed for the *Tampico* again, and at 8.48, after one hour of fighting, she scored her second hit. This shell carried away the *Tampico's* gaff and with it went the immense flag previously mentioned. No physical or material damage resulted, but the loss of the *Tampico's* colors no doubt cheered up the *Guerrero's* crew. Two minutes later, at 8.50, the *Guerrero* came about and headed away from the enemy.

During the entire engagement the *Tampico* was at anchor. She however resorted to a ruse which may or may not have gained its end. Oily waste and other combustibles were burned in the smokepipe in the attempt to lead the *Guerrero* into thinking that the *Tampico* was actually under way. This could hardly have deceived any one, but it does seem odd that the *Guerrero* failed to steam across the *Tampico's* stern in order to gain a greater danger space for her guns and to reduce the effective fire of the *Tampico* to the lone 4-inch gun mounted on her poop.

The *Guerrero* came about and presented her port side to the enemy at 8.52, at an estimated range of 5000 yards. I noted the firing interval at this stage and found that the *Guerrero* was firing at the rate of two shots per minute (six guns) and the *Tampico* at the rate of one shot every two minutes (three guns). No doubt the *Tampico's* defective ammunition did not fit in the guns, necessitating a waste of a great deal of time in trying to select brass cartridge cases that would go all the way into the chamber and permit the breech block to be closed. Furthermore, as they originally had only about 100 rounds of 4-inch, they may have been trying to save their supply until the *Guerrero* should reduce the range.

Two more of the *Tampico's* boats got adrift at 9.01. The *Guerrero,* at 9.07, probably angered by the long-drawn-out proceeding, headed for the *Tampico* and began to fire salvos The

mean point of impact was "The Gulf of Lower California" with the distance from the target expressed in "miles" instead of in "yards." One salvo was spotted as 500 yards over, 1000 yards over, and 2000 yards over, and this was a representative salvo. None of the salvos straddled the enemy. This erratic firing provoked much mirth among the *Preble* crew and there were many cries to the *Tampico* to "Soak her now!" The *Guerrero,* still heading for the *Tampico,* slowed down at 9.14 until she barely had steerage way on, and at 9.17 she turned away to port.

After the engagement I discovered that the *Tampico* had been hit in the starboard bow close to the 6-pounder gun, and that the shell had exploded inside the forecastle. That hit must have been made at about this period, but we could not see it from our ship. The forward 4-inch gun did not fire after this, and it is very probable that the exploding shell crippled that gun, possibly destroying its foundations. At 9.18 a shrapnel exploded just short of the *Tampico,* midway between the smokepipe and the forward bridge. This shell did not seem to hurt the ship itself, but the fragments probably killed some of the crew.

At 9.20 flames and smoke were seen to spring from the *Tampico's* quarterdeck. How they attempted to put this fire out I do not know as they had no steam on the ship and consequently would have no pressure in their fire-mains. Incidentally, the alcohol stored beneath the captain's cabin must have given them cause for anxiety. At 9.42 the *Tampico's* gasolene-launch and one pulling-boat came around her bow and secured along her starboard (engaged) side amidships. These boats remained there but a minute and then returned to the port side. Preparations for abandoning ship were evidently in progress. At 9.45 the flames on the *Tampico's* quarterdeck flared up with renewed vigor. Smoke poured forth in large volumes and completely enveloped the after gun. In spite of this the Rebels fired two more shots from that gun, even though I could not see the gun through the smoke and flames. One of the gun's crew stood up on the burning poop and defiantly waved a large flag. The *Guerrero* continued firing until 9.50.

It was then that we saw the *Tampico's* crew in their boats, the gasolene-launch towing one pulling-boat, heading for the shore. After the ship had been abandoned, the *Guerrero* ceased firing and proceeded at full speed for these boats in order to intercept them before they could get into shoal water. The battle proper ends at this time—9.50.

EVENTS IMMEDIATELY AFTER THE BATTLE

After a chase of about half an hour the *Guerrero* caught up with the two boat-loads of the *Tampico's* men. As there was no further hope for the boats to escape they pulled along side of the *Guerrero* and the prisoners were taken aboard. While the prisoners were climbing up the *Guerrero's* ladder, Malpica, standing up in his boat, in plain sight of everybody on the *Guerrero,* calmly placed his revolver to his head and shot himself, dying almost instantly. The *Guerrero* half-masted colors immediately, all the American vessels following suit. The commander of the *Guerrero* sent a radio to the commander of the *New Orleans* thanking the American vessels for half-masting colors "in honor of the death of Malpica." The *Guerrero* returned to a position about 400 yards to the southward of the *Tampico* and anchored. Boats were sent out from the *Guerrero* to the *Tampico* to investigate conditions aboard the latter ship, and a tow-line was passed from the *Guerrero's* stern to the *Tampico's* bow. The rescue party, however, reported that the *Tampico* could not be saved, and later on the tow-line was cut.

When the *Guerrero* ceased firing and started in pursuit of the boats, the American vessels closed-in on the *Tampico,* in order to render such assistance as might be needed; the *Preble,* happening to be the closest at that time, was the first to reach the spot and steamed to within 50 yards of her bow. There were several men rushing about her forecastle waving white rags. They climbed down the port boom and down the anchor cable, but refused to slide into the water and swim to the *Preble.* In the meantime the fire was spreading and the fixed ammunition was going off in all directions. Small-arm ammunition cracking away sounded like a machine gun. Suddenly the after magazine blew up and 4-inch shells were sent in all directions. Several of these were plainly seen and heard as they flew through the upper rigging of the *Preble.* At this juncture the *New Orleans* appeared and took charge of the situation. She lowered two boats which went close under the *Tampico's* bow and rescued the men who were jumping into the water close to the boats. Later on the *Guerrero's* boats picked up the last man who was floating about on a plank after the ship had sunk. That was Rebatet, the ex-paymaster, severely wounded.

While the *Preble* was close aboard the *Tampico* I noted the following conditions:

The main-deck aft had caved-in and the stern of the ship was a seething cauldron.
The starboard side of the forward bridge was wrecked.
Two corpses were plainly visible on the port side under the bridge.
The main-deck was covered with splintered gear fore and aft.
Shrouds of the mainmast were hanging over the stern.
The foretopmast was pierced, but the stick was still standing.
Gaff and colors were shot away.
Part of the aerial was carried away.
The after 4-inch gun had fallen down into the fiery furnace.
Rolls of paint were hanging from the outer shell aft clear down to the water-line.

The *Tampico* gradually listed to starboard, as the water came up higher and higher. At 11.35 the water had reached the main-deck and began to flow aft until finally it had risen sufficiently high to flow over the hatch coamings and down into the hole in the stern. At 11.57 clouds of steam arose, showing that the water was now flowing into the hole and the end was near. She heeled to starboard sharply, and, at 11.57½, her stern sank very suddenly lifting her bow up to an angle of about 45°. There she held for an instant, the imprisoned air in her bow buoying her up. The air-pressure now began to rip up the planking in the main-deck and spouts of water spurted up as the seams parted. The bow came up vertically, and then, with very little commotion, the ship slid down stern foremost under the surface. There were very few bubbles and no suction. All that remained of the *Tampico* were a few bits of floating wreckage. She sank in 22 fathoms.

About 1 p. m. Captain Irwin called on the commanding officer of the *Guerrero* and took me along with him. We met the captain and the executive officer, and had a short talk with them. They showed us the two holes in the *Guerrero,* which had done no damage to either the ship or personnel. There was no gayety nor any feeling of exultation aboard that ship; on the contrary, a funereal air seemed to pervade everybody and everything. They were very sorry that this battle had had to be fought, and especially regretted the death of Malpica. As they said, Malpica had been respected and admired by all the officers of the *Guerrero,* many of whom had previously served with him. They were profuse in their praises of his courage and ability and mourned his loss as that of a true friend instead of a defeated enemy.

The injured aboard the *Guerrero* were being attended by Surgeon McLean, U. S. N., of the *New Orleans,* assisted by the medical officer of the *Guerrero.*

The captain of the *Guerrero* stated that the prisoners would be treated kindly and I doubted very much if he would turn them over to the Federal authorities when he reached Mazatlan.

REVIEW OF THE BATTLE

The *Guerrero* used six 4-inch guns throughout the battle, and fired practically nothing but shrapnel. We were told that she was endeavoring to fire high in order to kill off the personnel and force a surrender rather than to injure the ship. The *Tampico* used her two 4-inch guns and her starboard 6-pounder, firing common, armor-piercing and shrapnel indiscriminately. The *Guerrero* fired 263 rounds and the *Tampico* 75. The *Guerrero* was struck twice, as previously noted. Her personnel escaped injury.

The *New Orleans* took six men off the *Tampico,* of which two were wounded; one of these died the following day, the other five were taken aboard the *New Orleans* to Mazatlan and, as I understand, eventually transported to the United States. The captain of the *Guerrero* did not request the surrender of these men from the *New Orleans* to the *Guerrero.* Of these six men one was a seaman (second-class), two were petty officers (second-class), and three were privates of infantry (*soldados*).

The captain of the *Guerrero* stated that of the men taken prisoners from the *Tampico* 12 were seriously wounded, and 12 to 15 more suffered minor wounds.

Later on I interviewed these prisoners aboard the *New Orleans.* The two petty officers (Francisco Alvarez, B. M., 2 Cl.; and Aciano Lamos, B. M., 2 Cl.), agreed in their tales, the substance of which is quoted:

> Captain Malpica took charge of the after 4-inch gun. The executive (Rebatet) similarly took charge of the forward 4-inch gun. The chief engineer (Johnson) was on the bridge with the machine gun. Throughout the fight the soldiers were a source of considerable trouble, as they did not know the ship and the guns, and had no taste for fighting aboard ship. They were the first to abandon the vessel. The *Tampico* was hit above water five times:
>
> (a) One shell killed two men, Luesa and Salvador.
>
> (b) Another hit did no damage except to carry away the colors.

(c) The third hit killed one *soldado,* and probably was the shell that wounded Rebatet.

(d) The fourth hit killed two men, and seriously wounded Estrada. During the engagement Malpica had rebuked Estrada for carelessness in allowing the boiler to be burned out, telling him that he was the direct cause for the condition in which they now found themselves. Estrada, wounded, went into the radio shack and, with his head between his arms, cried over his reprimand, and died in that position. It was also reported that he had shot himself while in the radio shack. His body sank with the ship.

(e) The fifth hit did no damage.

In addition to these hits, these men claimed there were seven hits in her stern under water. I do not believe it possible that seven shells could have struck there without our seeing some of them as they struck. These shells were said to have exploded in the ship, setting fire to the alcohol and thereby starting the fire which finally caused her to sink. When the ship was abandoned Malpica was the last to enter the boats. These men and the other men who had been rescued by the *New Orleans* had gone below to plug up shot-holes under water. They had been called to come on deck to abandon ship, but they thought there was no special hurry and delayed, and when they did finally come on deck the boats had shoved off. They did not blame Malpica, but took all the blame on themselves for having been abandoned aboard ship.

The elevating gear on the after gun had broken down during the action. The forward 4-inch gun was disabled soon after the firing started. They had fired all their ammunition that was fit for firing before they left the ship and then abandoned because the fire could not be checked and the water was rising in the hold. Before abandoning her the crew opened the sea-valves. To the best of their knowledge, there were only five men (all dead) aboard ship when she sank.

To sum up the fate of the officers and men:

Malpica (commanding) committed suicide.

Rebatet (executive) wounded in chest and leg; found floating on plank; was cared for on *Guerrero,* and probably survived.

Johnson (chief engineer) prisoner on the *Guerrero,* uninjured.

Estrada (assistant engineer) died in the radio shack and body sank with the ship.

Vela, machinist
Gonzales, "
Araryo, "
} Fate unknown; probably prisoners on *Guerrero.*

Of the crew, six were prisoners on the *New Orleans,* of whom one died. There were about 48 prisoners on the *Guerrero,* of whom 12 were seriously injured and 12 suffered minor injuries. The remainder, about five, were undoubtedly lost with the ship.

PHOTOGRAPHS

The accompanying photographs are very indistinct. The originals, filed in Office of Naval Intelligence and in the Department, are not much better.

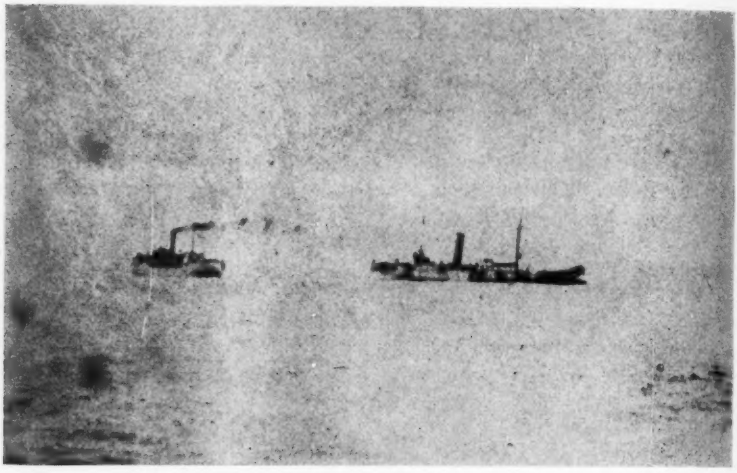


FIG. 1.—*Tampico* (right) and *Guerrero* (left). *Guerrero* returning to *Tampico* after capturing boats. (Photograph taken from the *New Orleans.*)

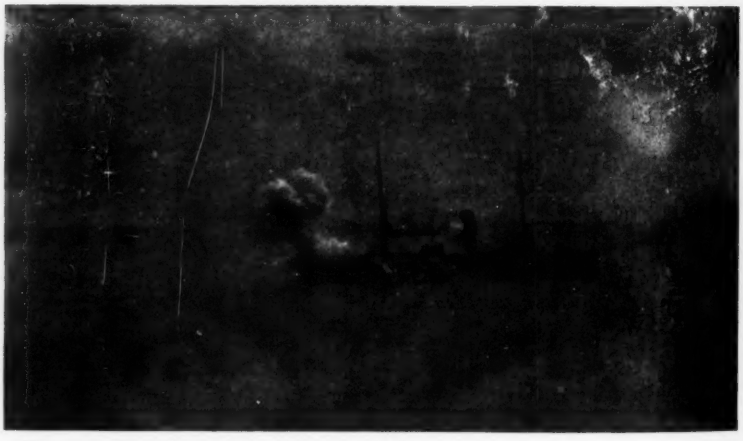


FIG. 2.—*Tampico* afire. Note explosion of ammunition. *Guerrero* on extreme right. *Preble* seen over *Tampico*. *New Orleans'* boats in foreground, one alongside starboard bow, the other on right edge. (Photograph taken from the *New Orleans.*)

FIG. 3.—*Tampico* ablaze. Taken shortly after she was abandoned. *Preble* on left. (Photograph taken from the *New Orleans.*)

FIG. 4.—*Tampico,* view of, close aboard. (Photograph taken from the *New Orleans.*)

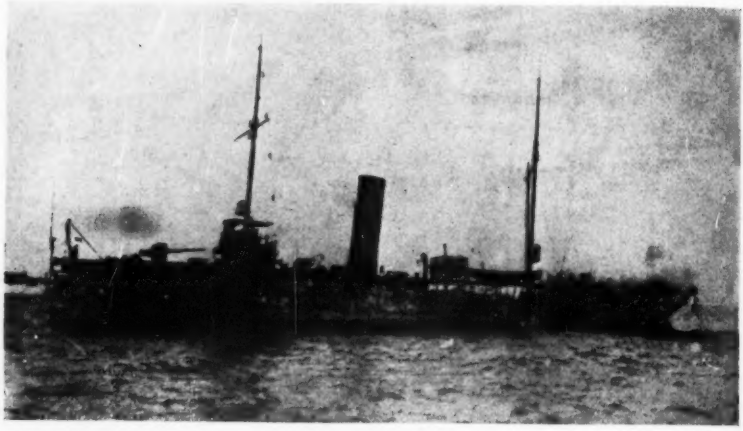


FIG. 5.—*Tampico*, view of, close aboard. *New Orleans* on extreme left. (Photograph taken from the *Preble*, just after magazine explosion when the *Preble* was backing away.)

FIG. 6.—*Tampico* sinking. *Preble* on right. *Guerrero's* stern on extreme right. (Photograph taken from the *New Orleans*.)

No. 316-2-328-JHK-WLM.

U. S. S. "PREBLE."
PICHILINQUE BAY, L. CAL., MEXICO.
June 17, 1914.

To: Commander-in-chief, U. S. Pacific fleet.
Via: Commander, torpedo flotilla, Pacific fleet.
Subject: Report of operations.
Reference (a): Flotilla commander's letter No. 705-103 of 6-14-14 and commander-in-chief's first endorsement of same date.
Inclosure (A): Copy of rough notes made during engagement of *Guerrero* and *Tampico*.

1. In accordance with provisions of reference (a), I left Mazatlan at 3.30 p. m., Sunday, June 14, and headed for Topolobampo.

2. During Sunday night I sighted a vessel to westward and pursued her until satisfied that it was not the *Tampico*. I then set a new course toward Topolobampo.

3. At daylight, Monday, June 15, I sighted another vessel to westward which I pursued until I discovered her to be a mail steamer. I then again set a new course toward Topolobampo.

4. About 7.30 a. m., I sighted a vessel to westward which I finally made out to be the *Tampico*. Her position then was Lat. 25° 14′ North, Long. 109° 07′ West. The events cited in paragraphs 2 and 3 are given in order to explain how I came to discover the *Tampico* so far to westward of my original course.

5. The *Tampico* seemed to be under way, so I stopped to southeastward (2 miles) waiting for her to pass. As she did not make any headway, I steamed toward her so as to clear her about one mile to eastward. When almost abreast of her, she lowered a boat which headed toward *Preble*, so I hove-to.

6. The executive officer of the *Tampico* came aboard and from him I received the following information:

"*Tampico* had been sunk at Topolobampo by *Guerrero*, and, after lying under water about two months, was raised and made ready for sea. On Sunday, June 14, 1914, the *Tampico* left Topolobampo under one boiler and proceeded to sea en route to Altata, Mexico. There she expected to retube her boilers and prepare to give battle to *Guerrero*. After proceeding to sea about 30 miles, her one remaining boiler was burned out and she was now temporarily helpless. Repairs would be made and she would proceed to Altata by sunset. Her complement consisted of 56 men and the following officers:

Captain Hilain Rodriguez Malpica (erstwhile executive of *Tampico* while still under Federal control).

Executive officer Augustin V. Rebatet (erstwhile paymaster).

Chief Engineer David Johnson (erstwhile chief engineer), is real Mexican despite his name.

Machinists:
Ramon Estrada.
Filiberto Vela.
Porfirio Gonzales.
Floreus Araryo."

7. After Rebatet returned to his ship I withdrew to a position about two miles to northwestward and hove-to.

8. The *Perry* joined *Preble* at 1 p. m.

9. About 3 p. m., same day, the chief engineer (Johnson) and the first assistant engineer (Estrada) came aboard. They gave me the following information:

> "The repairs to the boilers could not be made. The *Tampico* was helpless in regard to her boilers; therefore, she would have to drift ashore. They requested me to tow them to Altata, and when I refused they begged me to wire the commander-in-chief and request a tow, which request was complied with. They invited me to visit their ship."

10. About 5.30 p. m., I went aboard *Tampico*. Their commanding officer excused himself for not calling on me because of a wound in his left foot (where he had accidentally shot himself while cleaning his revolver) and therefore could not walk. In reply to his numerous inquiries I explained to him my mission, assured him that my radios would be sent in cipher, emphasized the fact that I was a neutral and could not therefore assist him in any way as long as his vessel remained afloat, and that I would notify the commander-in-chief of his helpless plight and could do nothing without commander-in-chief's sanction.

11. The commanding officer then presented his officers and requested me to inspect his ship for my own information, which I did and found the following conditions to exist:

(a) The ship, as a whole, was a mass of wreckage, was dirty, filthy and unsanitary, and the poorest excuse for a man-of-war that could possibly be imagined.

(b) The captain's cabin was littered with cases of stores, provisions and small-arm ammunition.

(c) The officers' quarters were in the same condition.

(d) The main-deck was strewn with every imaginable variety of splinter-producing litter. Three live cows were roaming the decks scattering fodder, etc., all over the ship.

(e) The four 6-pounder semi-automatic guns which were originally mounted on main-deck were now missing.

(f) The boats on the skid-beams were unseaworthy.

(g) An aerial was in position, but the radio house (a wooden shack wounted on skid-beams) contained no instruments.

(h) On the port side of the bridge was mounted a machine gun. About 30 boxes of loaded belts were scattered about on the bridge.

(i) Inside the forecastle, where the crew was temporarily housed, I saw two 6-pounder semi-automatic guns, apparently in condition to fire.

(j) On the forecastle-deck, and on the poop-deck were mounted the two 4-inch rifles. They were said to be very unreliable. My examination showed them to be badly eroded, sights antiquated, breech plugs loose on their hinges, much lost motion in both sight and training mechanisms, and, taken all in all, more dangerous to their own crew than the enemy. Many boxes of ammunition (both 6-pounder and 4-inch) were scattered all about the decks. I noted that blind shell, armor-piercing shell, and shrapnel were promiscuously mixed, shrapnel predominating. Was informed that *Tampico* had about 100 rounds of 4-inch for both guns and an unlimited supply of 6-pounder ammunition.

(k) Below decks I saw the plugged up shot-holes. They seemed to have been plugged with canvas, redlead and wooden plugs—sorry makeshifts. However, I was told that she was water-tight and all bilges were dry.

(l) The main engines were badly rusted, but could be used at slow speed. The generator was entirely out of commission, so they had no lights except kerosene lanterns. The ice-machine and many pumps were out of commission. The evaporator was said to be in fair condition. As there was no steam on the ship, I did not see any of this machinery working.

(m) Both boilers were dead, boiler fronts taken down and hand-hole plates taken off. She had two Babcock and Wilcox boilers. Salt crystals were hanging from the tubes, steam and fresh-water piping and water glasses. I was told that many of the tubes were leaking (about 500) and that they were being plugged with wooden plugs. Table legs were broken up for some of these plugs.

(n) The crew were a hard-looking lot of Mexicans; quite a few of them were wounded and badly scarred. Some of them wore hardly any clothes. The captain told me that he had but 38 men in his crew including 15 firemen, six seamen, and that the rest were *soldados*. He explained that he had no artificers and that the burned-out boiler was due to the carelessness and inexperience of the 15 shovelers. Had he had a few water-tenders and machinists he would have been able to reach Altata and be properly repaired.

12. Before leaving the ship, the captain said he intended to drift until he reached the shoal and then anchor, and that if the *Guerrero* hove in sight he would engage her even though at anchor, if he could reach her with his guns.

13. During the night of June 15, and morning of June 16, the three vessels drifted to the northwest until the shoal was reached, when the *Tampico* dropped both her anchors. Position, Lat. 25° 28′ 30″ North, Long. 109° 18′ West.

14. At daylight, Tuesday, June 16, I discovered two vessels to the northward bearing down on us very rapidly. These proved to be the *Guerrero* and the U. S. S. *New Orleans*. On sighting us, the *Guerrero* stopped and prepared for battle.

15. The *Guerrero* then advanced in a southwesterly direction until 7.47 a. m. (Mazatlan time) when the *Tampico* opened fire with her after 4-inch gun. Range estimated at 8000 yards.

16. At the time of opening fire, the vessels were situated as follows:

Tampico anchored in 22 fathoms in position Lat. 25° 28′ 30″ North, Long. 109° 18′ West.

Perry about two miles to southeast of *Tampico*.

Preble under way, about two miles southwest of *Tampico*.

Guerrero about four miles to northwest of *Tampico*, heading southwesterly.

New Orleans about two miles to northwest of *Guerrero*.

17. During the engagement, the *Guerrero* steamed alternately northeast and southwest (approximately), invariably turning to port at each turn. The *New Orleans* steamed around to westward of *Guerrero*, and assumed a position two or three miles southwest of *Tampico*. *Perry* stood to southwest. *Preble* steamed parallel courses to *Guerrero*, keeping at right angles to line of fire midway between the two ships, and about two miles clear of the line of fire. I made a series of rough notes during engagement, appended, inclosure (A).

18. *Tampico* fired first gun at 7.47 a. m., last gun at 9.45 a. m. *Guerrero* fired first gun at 7.48 a. m., last gun about 9.50 a. m. *Guerrero* fired 263 rounds in two hours and two minutes and made four hits, two of which did no material damage. *Tampico* fired 75 rounds in one hour and 58 minutes and made two hits, neither of which did any material damage.

19. When both vessels ceased firing, I headed full speed for *Tampico* and saw three live men on her forecastle waving white rags. These men refused to jump overboard and swim to *Preble*. The after end of *Tampico* was burning very fiercely, and shell and small-arm ammunition were exploding very rapidly. Several 4-inch shells were seen flying in all directions. *Preble* approached within 50 yards of *Tampico's* bow in order to rescue any drowning men. Finally forced to back away because of exploding ammunition. The *New Orleans* later lowered two boats and picked up seven men around *Tampico's* bow. *Preble* remained in vicinity until about 11.30 a. m., then anchored about 800 yards to southwest of *Tampico*.

20. At 1 p. m. Captain Irwin of the *New Orleans* called on commanding officer of *Guerrero* and I accompanied him aboard. Much of the information contained herein was received from commanding and executive officers of the *Guerrero*.

21. *Guns.*—*Guerrero* used her six 4-inch guns throughout, firing practically nothing but shrapnel. The *Tampico* used her two 4-inch guns, and her starboard 6-pounder, firing shrapnel, armor-piercing and cannon shell indiscriminately.

22. *Boats.*—The *Tampico* secured all her boats to her port boom—unengaged side. The *Guerrero* kept all her boats stowed on deck.

23. *Hits.*—The four hits and damage inflicted on *Tampico* are described elsewhere in this report. The *Guerrero* was hit twice, one shell cut a half-moon in her cut-water and caused no further damage. One shell struck her port bow, about 15 feet above water, passed entirely through the ship, piercing several light bulkheads, but did not explode.

24. *Killed and Injured.*—The *Guerrero's* crew escaped without a scratch. The *Tampico* is said to have 10 dead and 10 injured, with the remainder prisoners—seven of which are on *New Orleans.* The commanding officer (Malpica) committed suicide (fired revolver through his mouth) while in his boat alongside of *Guerrero,* as the prisoners were being taken aboard. The first assistant engineer (Estrada) was killed in action. The chief engineer (Johnson) escaped injury entirely and is now on board *Guerrero.* The executive (Rebatet) was picked up by the *Guerrero* while floating away on a plank. The executive of *Guerrero* said something about an injury to Rebatet's left leg, but I could not understand his description of the injury. Of the fate of the machinists nothing could be learned. The commanding officer of the *Guerrero* intimated that the prisoners would be kindly treated and eventually traded. Of the fate of the captured officers nothing was said, but I do not think they will be summarily executed.

25. *Method of Firing.*—The gun crews of *Tampico* were seen to load the guns, then lie down, while some one pulled the lanyard. I do not believe that the guns were sighted and kept on the target while firing. The same procedure was noted on board the *Guerrero* by one of the officers aboard this ship. The wild shooting can therefore be easily accounted for. The firing of the *Tampico* was generally better than that of the *Guerrero.*

26. During the engagement the *Tampico* burned waste, etc., in their furnaces in order to deceive the *Guerrero.* This ruse evidently succeeded in part because the *Guerrero* overlooked the fact that she could have steamed back and forth across the *Tampico's* stern, thus cutting the *Tampico's* fire to the one 4-inch gun mounted on her stern. At no time during all the firing could the range have been much less than 4000 yards, while the mean range was close to 6000 yards.

27. At 2.30 p. m. the *Preble* got under way and proceeded to La Paz, the *Perry* was directed to return to Mazatlan and the *New Orleans* was making ready to follow the *Guerrero* to Mazatlan.

(Signed) J. H. KLEIN, JR.

INCLOSURE (A)

ROUGH NOTES MADE DURING AND IMMEDIATELY AFTER THE ENGAGEMENT BETWEEN "TAMPICO" AND "GUERRERO" OFF TOPOLOBAMPO, MEXICO, ON TUESDAY, JUNE 16, 1914

7.47 a. m. *Tampico* opened fire—after 4-inch gun—shell fell 400 yards short.
7.48 " *Guerrero* opened fire—1000 yards over.
7.48½ " *Guerrero* fired two guns—one short and one over.
7.49 " *Guerrero* fired one gun—1000 yards over.
7.50 " Engagement general; estimated range 6000 yards.
7.51 " *Guerrero* changed course to starboard.
8.00 " Shell from both falling from 1000 yards short to 1000 yards over. Very poor firing, probably no attempt at spotting.

8.02 a. m. *Guerrero* stopped, presenting starboard side to *Tampico;* estimated range 6000 yards. 11.10

8.11 " Marksmanship of both sides getting worse instead of better. Some shells (*Tampico*) falling half way to *Guerrero.* Probably due to defective, wet ammunition.

8.13 " Both vessels ceased firing. Reason for silence unknown.

8.16 " *Tampico* opens fire again.

8.20 " *Guerrero* came about, firing rapidly, presents port broadside, all shells falling short (for her).

8.22 " *Guerrero* easing toward *Tampico.*

8.24 " Apparently first hit. *Tampico* struck at level main-deck forward of mainmast. 11.15

8.34 " One of *Tampico's* boats adrift. 11.35

8.35 " Range estimated 4000 yards. 11.57

8.37 " *Guerrero* changes course to port, presenting starboard broadside.

8.40 " *Guerrero* again heads for *Tampico.*

8.48 " *Tampico* struck, shell carries away gaff on mainmast. *Tampico's* colors shot away.

8.50 " *Guerrero* heading away from *Tampico. Guerrero* firing at the rate of about two guns per minute. *Tampico* firing at rate of about one gun every two minutes.

8.52 " *Guerrero* came about, presents port side; range estimated 5000 yards.

9.02 " Two more boats of *Tampico* adrift.

9.07 " *Guerrero* heading for *Tampico,* firing heavy salvos. One salvo (3 guns) spotted 500 yards over, 1000 yards over and 2000 yards over. Firing erratic. Battle becoming joke.

9.14 " *Guerrero* still heading for *Tampico,* but very slowly.

9.17 " *Guerrero* turns to port.

9.18 " Sharpnel bursts short of *Tampico.* Damage inflicted between smokepipe and bridge along main-deck.

9.20 " Flames and smoke appear on *Tampico's* quarterdeck.

9.42 " Power launch and pulling-boat on *Tampico's* starboard side—evidently preparing to abandon ship.

9.45 " Fire breaks out on *Tampico's* quarterdeck. Smoke envelopes after gun. Rebels continue firing this gun and waving flag.

9.50 " *Tampico's* crew abandon her, having set her afire. *Guerrero* heading full speed for *Tampico* and ceasing fire.

9.55 " *Tampico's* crew in boats heading for beach. *Guerrero* in pursuit.

10.15 " *Preble* close aboard *Tampico,* three live men on forecastle waving white rags. *New Orleans* lowering boats and rescuing men who jumped overboard.

10.45 " *Guerrero* picks up *Tampico's* boats and captures crew. All ships half-mast colors.

10.50 " *Guerrero* sends boats to land men on *Tampico.*

11.00 " *Guerrero's* boats pick up last survivor (discovered later that it was Rebatet, the executive).

11.10 a. m. Main deck *Tampico* caves in. Seething caldron in after part of ship.

Following damage noted on *Tampico:*

(a) Starboard side forward bridge wrecked. Two corpses on port side under bridge.
(b) Main-deck covered with wreckage and splintered gear.
(c) Shrouds of mainmast hanging over stern.
(d) Foretopmast pierced, but topmast still standing.
(e) Gaff and colors shot away.
(f) Part of aerial carried away.

11.15 " *Tampico* listing to starboard, sinking gradually.

11.35 " Water up to main-deck.

11.57½ " Water flows in after part (burned out), ship reels to starboard, suddenly stern sank, bow inclined 45°, decks bursting from air-pressure, bow nearly vertical; suddenly all glides under, air bubbles, no suction, little floating wreckage. *Tampico* is no more.

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DISTANTIAGRAPH

By W. D. FARRIS

The instrument represented by the accompanying drawing is designed to determine the actual distance a ship must pass off a light or point. The elements in the determination of said distance are two bearings and the distance run between them.

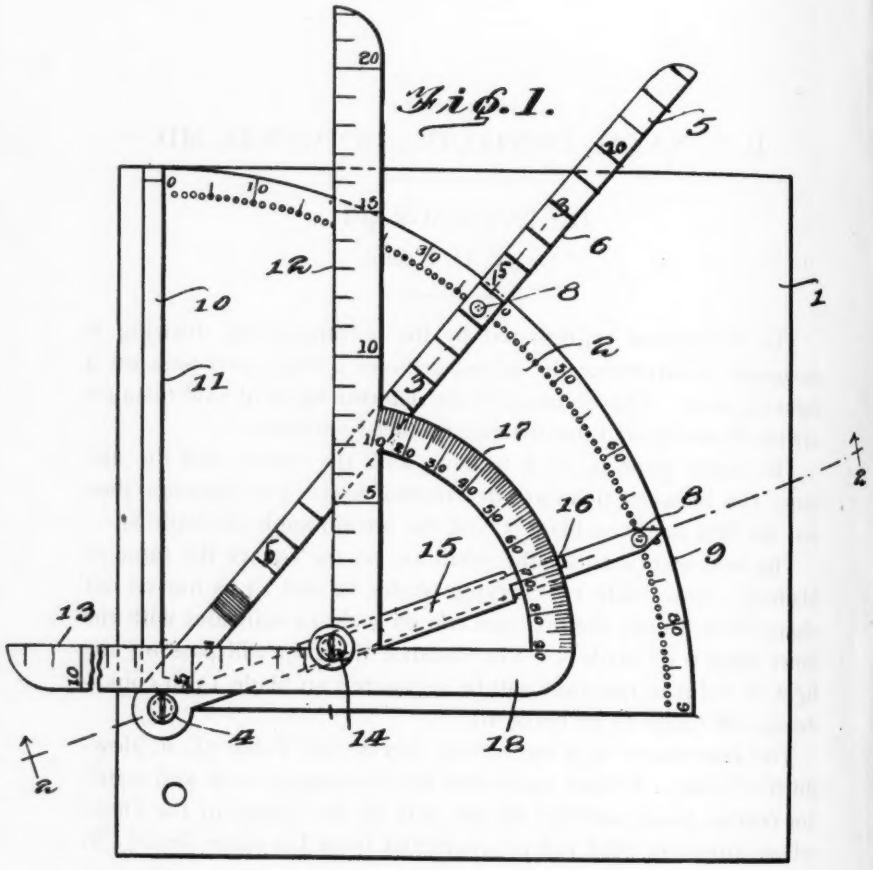
The angle made by each bearing with the course and the distance run between them are determined first. The operator then sets the first angle on blade 5, and the second angle on blade 8.

The next step is to set the small arc on the square the same as blade 8. Now, slide 15, carrying blades 12 and 13, is moved out along blade 8 until the distance run on scale 12 coincides with the inner edge 6 of blade 5. The distance the ship will pass off the light or point in question will be registered on blade 13 in coincidence with edge 11 of blade 10.

The instrument is a mechanical device for Table 5B in Bowditch's Tables. It does away with the necessity to wait and watch for certain point bearings on the part of the Officer of the Deck, whose attention need not be distracted from his other duties. It makes unnecessary going below deck to secure point bearings during unfavorable weather. The only light necessary for its use at night is the binnacle light. The other factors in its favor are: (1) Its simplicity of construction (being made of metal, it will be waterproof); (2) the simplicity of its operation, already described.

There are additional uses for this instrument. It will determine: (1) The approximate distance a ship will pass off a lighthouse; (2) the initial range and deflection for gun-firing. For the determination of the approximate distance, a bearing is taken and the number of degrees off the bow is set on blade 5. Now, blade 8 and arc 17 are set at 90 degrees; slide 15 is run out until the visibility of the light from the bridge in miles on the scale on

Fig. 1.



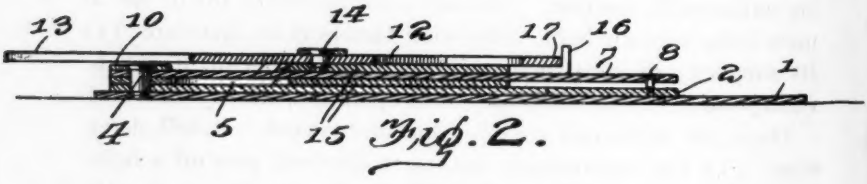


Fig. 2.

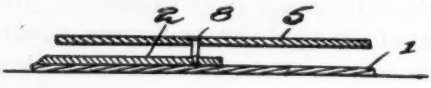


Fig. 3.

blade 5 coincides with the inner edge of blade 12. Blade 13 will then register the distance in question, if the course is maintained.

The calculation for finding the initial range and deflection for gun-firing involves three steps: (1) Gun correction, (2) wind correction, (3) target correction. It replaces the well-known rule of thumb. In the case of gun correction we must remember to use three-quarters of the ship's speed on the scale. Set blade 8 and arc 17 at 90 degrees; blade 5 is set at the number of degrees off the bow or stern the target bore; use the scale on blade 5 for the ship's speed, bringing blade 12 into coincidence with the speed indication. Then, blade 13 will give knots of deflection and blade 12 yards of range correction.

The same process is applied for wind correction. Now we use one-half of the Beaufort Scale of Wind on blade 5. The angle direction of the wind is set on blade 5. Blade 13 will indicate deflection in knots and blade 12 yards of range. For target correction use the speed of the target in knots on blade 5 and set the angle of its course with the line of fire on arc 9 with blade 5. Now bring blade 12 into coincidence with the speed of the target on blade 5; blade 13 will read the knots of deflection and blade 12 the yards of range.

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INSTRUCTION OF PETTY OFFICERS

By LIEUTENANT D. E. CUMMINGS, U. S. Navy

FOREWORD

This paper is submitted, not as a model, but rather as a suggestion as to what points need explanation. The general outline covered by this paper has been followed when appointments have been issued to petty officers; the general idea being to question the candidate to find out how completely he has the idea, and then to fill in the "holidays." The language used should be such as will be likely to impress the particular candidate, as should the example chosen. The more homely and everyday the examples chosen the more impressive they seem to be. A talk of this character, far from antagonizing a candidate, seems to be very well received, and a number have shown that they got the idea and profited by it. That being the case, there must be some value in it, and it is offered for what it is worth.

In rating petty officers it is only fair to them and to the ship and service that they be given a clear and definite idea of what their new office carries with it in the way of opportunity and of responsibility. This has been recognized in the Navy Regulations, which require that Article 3401 and the appointment be read by the candidate, and that the commanding officer deliver the appointment and sign as a witness, thus adding dignity and importance to the occasion and separating it in some degree from the single idea of an advance in pay.

When an appointment is issued to a petty officer he signs a statement thereon that he has read and *understands* the obligations imposed upon him by the appointment and by Article 3401, U. S. Navy Regulations, 1913. A little questioning, however, will usually show that the candidate's *understanding* of the meaning of that article, while perhaps correct, so far as it goes, usually falls far short of a complete understanding—and why shouldn't it? General Order No. 63 provides for a definite technical and pro-

fessional examination, but stops short of a full demonstration of what it means to be a *petty officer* as distinguished from a *rated man*. The "Bluejacket's Manual," 1915, contains a very valuable "little talk" to recruits on the subject of discipline and duty, but emphasizes obedience, punishments and a clear record chiefly. These phases of the question are of paramount interest to a recruit. A petty officer should be well indoctrinated in them and ready for a further development of his ideas of duty and discipline, a development along constructive lines, since he is now to assume definite responsibility in the upbuilding of the discipline and efficiency of the ship and of the service. Right here is where a few minutes' questioning by the division officer, the executive officer, or the commanding officer to determine how complete his understanding is, supplemented by such explanation as the answers show to be necessary, may prove of very great value to the candidate in enabling him more fully to meet the requirements of his office. Such an explanation would vary with the personality of the officer and of the candidate, and with the grasp of the subject indicated by the candidate's answers. It should always be remembered that it is the idea itself and not the technical definition that is important.

The candidate may be required to read aloud, paragraph by paragraph, Article 3401, explaining each paragraph in his own way as he goes along. Paragraph 1 reads as follows:

> Petty officers shall show in themselves a good example of subordination, courage, zeal, sobriety, neatness, and attention to duty.

Now, the principal idea of this paragraph is that a petty officer is an *example* to men of lower ratings. Every candidate knows that when he came into the service he got his ideas of how to get along by watching the people who had got along before him—the petty officers; and his own seagoing habits, whether good or bad, have been very largely the outgrowth of his contact with them. Obviously, then, it is important for him to think very seriously, now that he is himself to become a petty officer, of how he should conduct himself so that to-day's recruits may by his example be encouraged to become good service men.

This first paragraph goes on to state quite definitely along what lines that good example should be shown: First, subordination, which is a ready and unquestioning obedience to the letter and spirit of such orders as may be received from proper authority;

second, courage; third, zeal; fourth, sobriety; fifth, neatness; and sixth, attention to duty.

Paragraph 2 reads as follows:

> They shall aid to the utmost of their ability in maintaining good order, discipline, and all that concerns the efficiency of the command.

The outstanding idea of this paragraph is that the petty officer has got out of the class of those who always wait to be told; he keeps an eye out on his own account for the things that should be done, and it becomes his duty to keep things moving. His aim should be that when a job is given him to do, or when a job naturally falls to him, his superior officers and petty officers need not think twice about that job because they know it will be done, and that, if any obstacle arises that seems insurmountable, it will be promptly reported to them and not neglected. It is not a crime to ask for assistance or advice, but to neglect a problem because one does not see the answer is unforgivable in a petty officer.

The meaning of the word discipline is a very important point to make clear. Discipline is variously defined: as education; as development of the faculties by instruction and exercise; as training, whether physical, mental or moral; as training to act in accordance with established rules; as accustoming to systematic and regular action; as drill; as subjection to rule; as submissiveness to order and control; as control; as a habit of obedience (Webster). All these definitions contain the idea of co-ordination by adherence to established rules; of instruction and exercise; of training and development; and underlying them all is the idea of authority.

Efficiency is defined by Webster as the "quality of . . . . getting an effect," or, in common parlance, efficiency means getting the answer. There are three qualities necessary to the efficient performance of a job. In some cases one of these qualities is the most important, in some cases another; but in all cases all three apply. The first quality is that the job, whether it be rendering honors, scrubbing decks, or sinking an enemy ship, shall be well and thoroughly done—going through the motions doesn't get much answer. The second quality is timeliness. For example it is far more important that a job be ready when it is needed than that it be performed economically. But the fact that the requirements that a job must be well done and done in time stand first does not in any way lessen the importance of the third quality, which is that it must be done economically—at the least cost of

time, labor and material. If you use all hands on a job that could be done by one section, your next job lies idle when it might as well be under way; and then where is your efficiency? And, equally, if you try to do with a section a job that requires all hands, how can you expect to get the answer?

Discipline, efficiency, and team-work are very much alike. In all, the man must be competent to do his own job—whether it is playing shortstop or steering a life-boat. When the Red Sox have the field and the batter makes a hit, all the rest of the players do not look at the first baseman and see whose field the ball is headed for and then sit down on their bases and watch them make the play; instead of that, every man on the team gets into position to back up those making the play. The pitcher will perhaps back up first, ready to take care of an overthrow; shortstop and second get ready to catch their man at second if necessary; each man backs up the man making the play, so that they go ahead confidently, knowing that the rest of the team will do their part, and even if everything doesn't " break " right, not much will get through them. So in a well-disciplined ship there is a habit of co-operation, and everybody not only does his own job right, but does it in such a manner as to make the other man's job easier. The fireman doesn't track coal dust on a clean deck, and the deck hand doesn't sift loose dirt down the fireroom hatch. And, too, this co-operation is both upward and downward—good discipline means that a petty officer not only does his job so fully and well that his superior officers don't have to worry about it and keep after him; but also that he keeps a good eye to the work of the men under him so that they can work to the best advantage—foresees, perhaps, the need for a fresh supply of sharp scrapers and provides them in time; plans his work so that it can all be done in orderly fashion at the proper time; instructs his men how to work to the best advantage; and sets high standards so that they may learn to know a good job when they see it.

Another phase of discipline is that all hands should play the same game—follow the same rules. What is more ridiculous than a boat's crew trying to win a race with all hands pulling a different stroke? Yet it might happen that the members of that crew individually are good oarsmen, only trained under different methods—one pulls with his back and another with his arms, one makes a quick finish to his stroke and another pulls evenly throughout. It is perfectly plain that they are bound to interfere with one

another and fail to keep stroke. It may well happen that there are several strokes that are perfectly good. Obviously, one has to be chosen; and any good stroke energetically followed is better than shifting constantly from one stroke to another, however excellent the various strokes may be. Until the crew all work together to accept *one* stroke—not all of them will consider it the best, perhaps—and train until they can follow it, they have neither discipline nor efficiency nor team-work. So that discipline involves a recognition of whose business it is to decide what to do and how to do it, and a cheerful acceptance of his decision.

Team-work, co-operation, doing your own job well, making the other fellow's job easier, playing the same game, according to the rules, acceptance of authority—these are the materials of which discipline is made; and the Regulations and Orders are the rules of the game.

Paragraph 3 reads thus:

> They are always on duty, even while on liberty, as far as breaches of discipline are concerned, and they shall endeavor to preserve order at all times. In case men are disorderly on shore, petty officers must arrest them and return them to their ships.

It is obviously desirable to keep men out of trouble, rather than to get them into it, and therefore to prevent disorder rather than to quell it after it happens; and this is often done by the patrol when they send men who are beginning to show too much exhilaration off to their ships before they get into trouble.

The more petty officers there are who perform their duty in this respect the less disorder and consequent trouble there will be for men ashore, and the better will be the reputation of the naval uniform—which is made chiefly by those men whose actions are most unpleasantly conspicuous. Remember that the disorderly man on shore wears the naval uniform just as does the officer of the deck, just as does the captain, just as does the admiral, and just as do you, the petty officer about to receive your appointment. In requiring order on the part of men ashore, then, you are not only carrying out your bounden duty, but you are protecting the reputation of your own uniform in the service. Do not let irresponsible men be disorderly, if not for their sake, then for your own.

To sum up, you, as a petty officer, are assuming a new responsibility, and to be an adequate example to men of inferior ratings, to be subordinate, attentive, and to promote good order, dis-

cipline, and all that affects the efficiency of the command, you must exert every effort to realize and grow up to your responsibilities; and keep in mind that because other men may let down the standards is no reason for your doing so—the more you hold up the standards the better for you personally, and the more petty officers there are who do the same, the better it will be for the service.

GENERAL.—In putting into practice the above principles, one or two pitfalls may be avoided if their nature is understood. It will often happen that the prescribed method of doing things may not seem as good as some other way that you know about; or some restriction in regard to liberty or to hours or methods of work may not strike you as being just fair. There are two ways to act in such a case. One is to sulk, or to growl, or to criticize, to to "knock"; to go about it in a half-hearted way, and to let your discontent be evident to those under you. The result of this course is to make your own job harder, because your discontent rapidly spreads to those under you and you will find it doubly hard to get work out of them. It also undermines the dicipline of the ship and makes trouble, not only for yourself but also for those men who are encouraged by your remarks or actions to do things that will get them into trouble. The other way is to assume that whoever has given the order has given it in good faith, and had good grounds for it, some of which you may not know; that, even if the method isn't perfect it can be made to work if you do your part; and to keep your doubts carefully hidden away in your own mind, and go ahead and carry out your orders. Sometimes it is permissible to state your doubts at a proper time and place to whoever gives the order; but never to the man that is to do the work—you at once double your own job. The result of this second way is that the job gets done with less friction, your men are more content, your job is lightened, and your reputation and efficiency are raised in the eyes both of those over you and of those under you. Be a "booster," not a "knocker."

It is hard for a petty officer to be unduly intimate with his subordinates and still maintain proper discipline. When you become a petty officer keep your eyes to the front—not to the rear. If you were not a better man than those under you you wouldn't be a petty officer—that's why you are rated, because you are a better man than some others. You may not have been any better originally, but now you are entitled to the respect of the men under you, and you can't get it by smoking their "butts."

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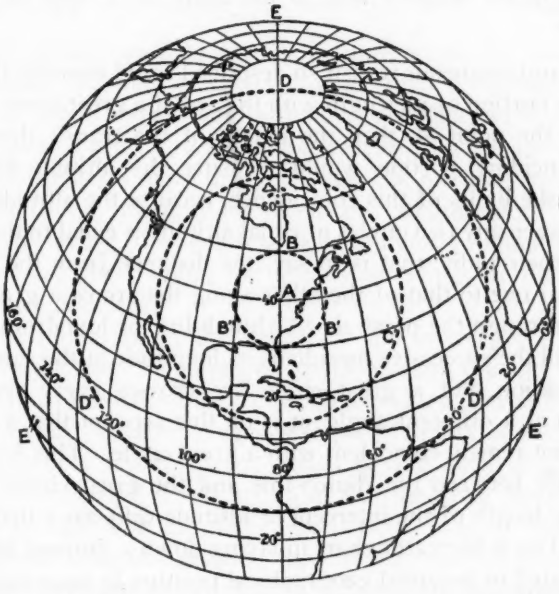
THE CHART AS A MEANS OF FINDING GEOGRAPHICAL POSITION BY OBSERVATIONS OF CELESTIAL BODIES IN AERIAL AND MARINE NAVIGATION

By G. W. LITTLEHALES

The subject may be introduced by quoting the article of the American Practical Navigator, entitled "Circles of Equal Altitude," in which the accompanying figure is described:

In the figure, if $EE'E''$ represent the earth projected upon the horizon of a point A, and if it be assumed that, at some particular instant of time, a celestial body is in the zenith of that point, then the true altitude of the body



as observed at A will be 90°. In such a case the great circle $EE'E''$, which forms the horizon of A, will divide the earth into two hemispheres, and from any point on the surface of one of these hemispheres the body will

be visible, while over the whole of the other hemisphere it will be invisible. The great circle $EE'E''$, from the fact of its marking the limit of illumination of the body, is termed the *circle of illumination*, and from any point on its circumference the true altitude of the center of the body will be zero. If, now, we consider any small circle of the sphere, $BB'B''$, $CC'C''$, $DD'D''$, whose plane is parallel to the plane of the circle of illumination and which lies within the hemisphere throughout which the body is visible, it will be apparent that the true altitude of the body at any point of the circumference of one of these circles is equal to its true altitude at any other point of the same circumference; thus the altitude of the body at B is equal to its altitude at B' or B'', and its altitude at D is the same as at D' or D''.

It therefore follows that at any instant of time there is a series of positions on the earth at which a celestial body appears at the same given altitude, and these positions lie in the circumference of a circle described upon the earth's surface whose center is at that position which has the body in the zenith, and whose radius depends upon the zenith distance, or—what is the same thing—upon the altitude. Such circles are termed "circles of equal altitude." It is important to note that an observer making an instantaneous transit through the latitudes and longitudes passed over by any rhumb-line or loxodromic curve drawn within the hemisphere of illumination, through the point A, will experience no astronomical difference, with reference to the observed body in the zenith of A, save an altitude-difference.

If the instantaneous transit so described could coincide throughout some portion of its length with the arc of a great circle passing through the point A, then the extent of the transit throughout such coinciding portion would measure the altitude-difference between the limits of this coincidence, because the altitude-difference between any two circles of equal altitude is equal to the difference of their radii; that is to say, the distance from the circumference of one to that of the other along the arc of a great circle passing through the point A. A rhumb-line or loxodromic curve crosses all the successive meridians of longitude at the same angle of inclination, but a great circle arc crosses every successive meridian at a different angle; it is on this account that a rhumb-line cannot remain coincident with a great circle. This feature of divergence between the rhumb-line and the great circle is what limits the length of the intercept or altitude-difference that can be employed on a Mercator chart in laying down a Sumner line from an estimated or assumed geographical position in accordance with the method, first proposed by Saint-Hilaire, in which a comparison is made between the altitude of a celestial body as actually *observed* and that *calculated* from the estimated or assumed position of the

observer; for the intercept is drawn as a straight line, which is a rhumb-line on the Mercator chart, while the altitude-difference is in reality the arc of a great circle, which is a curved line on the Mercator chart except when coinciding with a meridian or with the equator. Hence it is only within an extent in which the divergence between the two is not of consequence that the straight line intercept on the Mercator chart may be looked upon as representing the true distance to the Sumner line and the true direction at right angles to which that line is to be drawn.

Before proceeding to inquire how this limitation may be removed, let us ascertain the amount of its effect in turning the Sumner line out of its true direction; for it is in this respect that the effect of the divergence between the rhumb-line and the great circle first manifests itself and gains its most rapid advance as a source of error in fixing position at sea by intersecting Sumner lines plotted on the Mercator chart. If a table were formed giving the change in azimuth for an altitude-difference of one minute of arc, corresponding to successive values of the altitude h' and the azimuth Z' in the expression $\frac{\Delta Z}{\Delta h} = -\tan h' \cot Z'$, it would appear from this tabulation that, in some circumstances, the direction of the Sumner line may be affected more than a degree for each minute of arc in the altitude-difference, and that, while the effect is in general much more moderate, especially when the observed celestial body bears more than 45° from the meridian and has not yet risen to 45° in altitude, yet in no circumstances could an altitude-difference of a length of several hundred minutes of latitude be employed without too greatly affecting the direction of the Sumner line.

As this limitation in the length of the intercept or altitude-difference that may be employed arises through the adoption of a straight line to represent an arc which is really a curved line on the Mercator chart, we are led at once to perceive that, if we construct a chart upon a system of projection having such qualities that angles are preserved nearly true and that the great circle is practically a straight line and that there is uniformity of scale within the required limits of tolerance, then we may employ intercepts of any length requisite to lay down a Sumner line anywhere within the limits of a chart from a single position chosen within its borders; and, if the simultaneous altitudes and azimuths of the

celestial bodies should be tabulated as they would appear at stated intervals of time in the chosen geographical position within the limits of the chart, an observer, in a position as yet unknown, having measured the altitude of a celestial body, could at once lay down his line of position by comparing the altitude so measured with the tabulated altitude of that body and laying off the difference between the measured and the tabulated altitude as an intercept from the chosen geographical position in the direction of the azimuth of the celestial body, as ascertained from the tabulation, and toward or away from the bearing of the body according as the measured altitude was higher or lower than the tabulated altitude. The extremity of the intercept thus laid off marks a point through which passes the Sumner line upon which the observer's position lies.

The polyconic projection, which has been extensively used in the production of charts and maps in America, possesses the qualities required for this purpose, and, accordingly, a chart of the United States constructed upon this projection has been selected as an illustrative specimen to show that geographical position is found by this method with that degree of promptness in reaching quick conclusions which is demanded in aerial navigation.

The tables[1] of simultaneous altitudes and azimuths represent these elements as they would be measured by an observer stationed in the middle of the chart, in latitude 39° and longitude 97°, at intervals of 4 minutes of hour angle from his meridian, and the tabulation embraces, besides the brighter stars, the range of the declination, both north and south of the equator, of the sun, the moon, and the planets. A large compass diagram has been centered at the middle position in latitude 39° and longitude 97°, since all the altitude-differences are laid off from there; and circumferences of equal distance from this point have also been supplied, in order that, with a given altitude-difference, the observer may at once proceed to find the point through which his line of position is to be drawn by passing out by the amount of the altitude-difference to the proper drawn or intermediate circumference along the

[1] In these tables, while the azimuth is stated in degrees and tenths of a degree, the altitudes are set down in degrees and minutes, since the minute of altitude corresponds closely with the geographical mile. Future experience is relied upon to dictate whether the altitude should be expressed in degrees and decimals of a degree instead of degrees and minutes.

radial indicated by the azimuth ascertained from the bordering tabulation.

The following example, whose solution is indicated by the intersection of the lines *AB* and *CD* on the chart, will afford a specific illustration of the procedure:

Example.—Being in flight between Leavenworth, Kans., and San Francisco, Cal., during the night of February 1, 1917, at $6^h\ 59^m\ 14^s$ by a watch regulated to sidereal time of the meridian of the central position of the chart (97° or $6^h\ 28^m$ West of Greenwich), observed simultaneous altitudes of α Tauri (Aldebaran), bearing westward, and α Leonis (Regulus), bearing eastward. By horizon-free sextant, true altitude of α Tauri, 55° 35′ and of α Leonis 35° 13′. Find the geographical position of the observer.

Solution.—	α Tauri (Aldebaran) h m s	α Leonis (Regulus) h m s
Local sidereal time	6 59 14	6 59 14
Right ascension	4 31 12	10 04 00
Hour angle	2 28 02	3 4 46

With these hour angles entering the tabulation on the chart under the names of these stars	Az. N. 114°.5 W.	N. 110°.1 E.
	Alt. 50° 34′	41° 19′
Measured altitude	55° 35′	35° 13′
Altitude-difference	5° 01′ = 301′	6° 06′ = 366′
	in direction N. 114°.5 W. or S. 65°.5 W.	in direction (180° + 110°.1) = 290°.1 or N. 69°.9 W.

The position-lines resulting from these observations have been plotted on the chart by passing out to the distance circumference 301 (=5°−01′) along the radial N. 114°.5 W. and through the point thus arrived at, drawing the position-line *AB* at right angles to the radial; and, likewise, by passing out to the distance circumference 366 (=6°−06′) along the radial N. 69°.9′ W., and through the point thus arrived at, drawing the position-line *CD* at right angles to this radial. The intersection of these position lines fixes the geographical position approximately over the city of Denver, in latitude 39° 45′ N. and longitude 105° W.

To amplify the illustration, a second example is presented as follows:

Example.—An observer in aerial flight along the coast of the Gulf of Mexico, during the morning of October 14, 1917, measures the true altitude of the sun's center to be 40° 14′ at $9^h\ 06^m\ 06^s$ a. m. by a watch regulated to

mean time of the meridian 97° or $6^h\ 28^m$ West of Greenwich. From the Nautical Almanac, the equation of time and sun's declination at time of observation are ascertained to be:

Eq. T. $= 13^m\ 54^s +$ to m. t., Dec. 8° 5′.4 S.

Find the Sumner line upon which the observer is located, and, by noting the intersection of this line with the coast line, the observer's geographical position.

	h	m	s	
L. M. T.	= 9	06	06	
Eq. T.	=+	13	54	
L. A. T.	= 9	20	00	
H. A.	= 2	40		Dec. — 8° 5′.4

Entering the tabulation on the chart with these values of the H. A. and Dec.

Measured altitude

Az.	132°	.7
Alt.	30°	04′
Alt.	42°	16′
	12°	12′ = 732′ in direction N. 132°.7 E.

Passing out to the distance 732 along the radial N. 132°.7 E., and drawing a Sumner line at right angles to the radial, locates the aircraft on the coast a little to the eastward of Pensacola.

Under self-imposed restrictions adopted in consideration of the circumstances and limited equipment of the aerial navigator, we have arrived at the solution of these observations for geographical position without the defaults which arise from treating the great circle arc of altitude-difference as a rhumb-line, and the exactitude with which the result has been reached would, if the scale of the chart had not been reduced, be sufficient to meet the requirements of aerial navigation. The availability of charts of like design will also prove efficient in meeting the required greater exactitude of marine navigation, if, instead of drawing the line of position as a straight line, the actual curve of the "circle of equal altitudes" be employed. This has the curvature on the present chart of a parallel of latitude representing a latitude equal to the altitude of the celestial body observed to obtain the "circle of equal altitude."

In this manner the actual curves for which the straight lines *AB* and *CD* were substituted have been supplied by the side of them in order that a comparison may be made in the case in point, between the position indicated by the intersection of *AB* and *CD* and that obtained by the intersection of the arcs of the actual "circles of equal altitude."

And attention should, perhaps, be drawn to the fact that portions of the tables of simultaneous altitudes and azimuths applicable to the case of a particular flight may be taken out beforehand, although it has not been found inconvenient to consult the tables in actual flight. Of course, it will not be overlooked that these tables would, without modification, serve a like purpose in relation to a similar chart of any other part of the world traversed by the 39th degree parallel of latitude, either in the northern or southern hemisphere.[1]

[1] The chart may be pasted on the back of an old chart with the tables adjoining if desired.

NORTH DECLINATION.

Hour Angle.	0°		1°		2°		3°		4°		5°		6°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0 0	51 0.0	180.0	52 0.0	180.0	53 0.0	180.0	54 0.0	180.0	55 0.0	180.0	56 0.0	180.0	57 0.0	180.0
4	50 59.4	178.4	51 59.4	178.4	52 59.4	178.3	53 59.4	178.3	54 59.4	178.3	55 59.4	178.2	56 59.4	178.2
8	50 57.4	176.8	51 57.4	176.8	52 57.3	176.7	53 57.3	176.6	54 57.2	176.5	55 57.2	176.4	56 57.1	176.4
12	50 54.2	175.2	51 54.1	175.1	52 54.0	175.0	53 53.8	174.9	54 53.7	174.8	55 53.6	174.7	56 53.4	174.5
16	50 49.7	173.7	51 49.5	173.5	52 49.2	173.4	53 48.9	173.2	54 48.7	173.1	55 48.5	172.9	56 48.2	172 7
20	50 43.9	172.1	51 43.6	171.9	52 43.2	171.7	53 42.8	171.6	54 42.4	171.4	55 42.0	171.1	56 41.6	170.9
24	50 36.8	170.5	51 36.4	170.3	52 35.8	170.1	53 35.3	169.9	54 34.7	169.6	55 34.2	169.4	56 33.6	169.1
28	50 28.5	169.0	51 27.9	168.7	52 27.1	168.5	53 26.4	168.2	54 25.6	167.9	55 24.9	167.7	56 24.0	167.4
32	50 19.0	167.4	51 18.2	167.1	52 17.2	166.9	53 16.3	166.6	54 15.3	166.3	55 14.2	165.9	56 13.1	165.6
36	50 8.2	165.9	51 7.2	165.6	52 6.0	165.3	53 4.8	164.9	54 3.5	164.6	55 2.2	164.2	56 0.8	163.9
40	49 56.2	164.4	50 54.9	164.0	51 53.5	163.7	52 52.0	163.3	53 50.4	162.9	54 48.8	162.6	55 47.1	162.1
44	49 43.1	162.8	50 41.4	162.5	51 39.7	162.1	52 37.9	161.7	53 36.1	161.3	54 34.1	160.9	55 32.1	160.4
48	49 28.7	161.3	50 26.8	161.0	51 24.8	160.6	52 22.7	160.1	53 20.6	159.7	54 18.3	159.2	55 15.9	158.7
52	49 13.2	159.9	50 11.0	159.5	51 8.6	159.0	52 6.3	158.6	53 3.7	158.1	54 1.0	157.6	54 58.3	157.1
0 56	48 56.6	158.4	49 54.0	158.0	50 51.4	157.5	51 48.6	157.0	52 45.7	156.5	53 42.7	156.0	54 39.5	155.4
1 0	48 38.9	156.9	49 36.0	156.5	50 33.0	156.0	51 29.9	155.5	52 26.5	154.9	53 23.1	154.4	54 19.6	153.8
4	48 20.1	155.5	49 16.8	155.0	50 13.4	154.5	51 9.9	154.0	52 6.2	153.4	53 2.4	152.8	53 58.4	152.2
8	48 0.2	154.1	48 56.5	153.6	49 52.8	153.0	50 48.9	152.5	51 44.8	151.9	52 40.5	151.3	53 36.0	150.7
12	47 39.3	152.7	48 35.3	152.2	49 31.2	151.6	50 26.8	151.0	51 22.3	150.4	52 17.6	149.8	53 12.7	149.1
16	47 17.6	151.3	48 13.1	150.8	49 8.4	150.2	50 3.7	149.6	50 58.7	149.0	51 53.6	148.3	52 48.2	147.6
20	46 54.6	150.0	47 49.8	149.4	48 44.8	148.8	49 39.6	148.2	50 34.2	147.5	51 28.6	146.9	52 22.7	146.1
24	46 30.8	148.6	47 25.6	148.0	48 20.1	147.4	49 14.5	146.8	50 8.7	146.1	51 2.6	145.4	51 56.3	144.7
28	46 6.0	147.3	47 0.4	146.7	47 54.5	146.1	48 48.5	145.4	49 42.2	144.7	50 35.6	144.0	51 28.8	143.3
32	45 40.4	146.0	46 34.3	145.4	47 28.1	144.7	48 21.6	144.1	49 14.8	143.4	50 7.7	142.6	51 0.5	141.9
36	45 13.9	144.7	46 7.4	144.1	47 0.7	143.4	47 53.7	142.7	48 46.5	142.0	49 39.0	141.3	50 31.3	140.5
40	44 46.5	143.5	45 39.6	142.8	46 32.5	142.1	47 25.0	141.4	48 17.3	140.7	49 9.4	139.9	50 1 2	139.2
44	44 18.4	142.2	45 11.0	141.6	46 3.4	140.9	46 55.6	140.1	47 47.4	139.4	48 39.0	138.6	49 30.2	137.8
48	43 49.4	141.0	44 41.6	140.3	45 33.6	139.6	46 25.3	138.9	47 16.7	138.1	48 7.8	137.4	48 58.6	136.5
52	43 19.7	139.8	44 11.4	139.1	45 3.0	138.4	45 54.2	137.6	46 45.2	136.9	47 35.8	136.1	48 26.1	135.3
1 56	42 49.2	138.6	43 40.5	137.9	44 31.6	137.2	45 22.5	136.4	46 12.9	135.7	47 3.0	134.9	47 53.0	134.0
2 0	42 18.1	137.5	43 9.0	136.8	43 59.6	136.0	44 50.0	135.2	45 40.0	134.5	46 29.7	133.7	47 19.1	132.8
4	41 46.2	136.3	42 36.7	135.6	43 26.9	134.8	44 16.8	134.1	45 6.3	133.3	45 55.6	132.5	46 44.6	131.6
8	41 13.7	135.2	42 3.8	134.5	42 53.5	133.7	43 43.0	132.9	44 32.1	132.1	45 20.9	131.3	46 9.3	130.5
12	40 40.5	134 1	41 30.1	133.4	42 19.5	132.6	43 8.5	131.8	43 57.2	131.0	44 45.6	130.2	45 33.6	129.3
16	40 6.7	133.0	40 55.9	132.3	41 44.8	131.5	42 33.5	130.7	43 21.7	129.9	44 9.7	129.1	44 57.2	128.2
20	39 32.3	132.0	40 21.2	131.2	41 9.7	130.4	41 57.9	129.6	42 45.7	128.8	43 33.2	128.0	44 20.3	127.1
24	38 57.4	130.9	39 45.8	130.1	40 33.9	129.3	41 21.7	128.6	42 9.1	127.7	42 56.1	126.9	43 42.9	126.0
28	38 21.9	129.9	39 9.8	129.1	39 57.6	128.3	40 44.9	127.5	41 32.0	126.7	42 18.6	125.8	43 4.9	125.0
32	37 45.8	128.9	38 33.4	128.1	39 20.7	127.3	40 7.6	126.5	40 54.3	125.6	41 40.5	124.8	42 26.5	123.9
36	37 9.2	127.9	37 56.5	127.1	38 43.4	126.3	39 30.0	125.5	40 16.2	124.6	41 2.1	123.8	41 47.5	122.9
40	36 32.1	126.9	37 19.0	126.1	38 5.5	125.3	38 51.7	124.5	39 37.6	123.6	40 23.0	122.8	41 8.2	121.9
44	35 54.6	125.9	36 41.1	125.1	37 27.3	124.3	38 13.1	123.5	38 58.6	122.7	39 43.6	121.8	40 28.4	120 9
48	35 16.6	125.0	36 2.7	124.2	36 48.5	123.4	37 34.0	122.6	38 19.1	121.7	39 3.9	120.8	39 48.2	120.0
52	34 38.2	124.0	35 23.9	123.2	36 9.3	122.4	36 54.4	121.6	37 39.2	120.8	38 23.6	119.9	39 7.6	119.0
2 56	33 59.3	123.1	34 44.7	122.3	35 29.8	121.5	36 14.6	120.7	36 59.0	119.8	37 43.0	119.0	38 26.7	118.1
3 0	33 20.1	122.2	34 5.1	121.4	34 49.9	120.6	35 34.2	119.8	36 18.3	118.9	37 2.0	118.1	37 45.3	117 2
4	32 40.4	121.3	33 25.1	120.5	34 9.5	119.7	34 53.6	118.9	35 37.3	118.0	36 20.7	117.2	37 3.7	116.3
8	32 0.4	120.4	32 44.8	119.6	33 28.8	118.8	34 12.6	118.0	34 56.0	117.1	35 39.1	116.3	36 21.8	115 4
12	31 20.0	119.5	32 4.1	118.7	32 47.8	117.9	33 31.2	117.1	34 14.3	116.3	34 57.1	115.4	35 39.5	114 6
16	30 39.2	118.7	31 23.0	117.9	32 6.4	117.1	32 49.6	116.3	33 32.4	115.4	34 14.8	114.6	34 57.0	113.7
20	29 58.1	117.8	30 41.6	117.0	31 24.8	116.2	32 7.6	115.4	32 50.1	114.6	33 32.3	113.7	34 14.1	112.9
24	29 16.8	117.0	29 59.9	116.2	30 42.8	115.4	31 25.3	114.6	32 7.5	113.7	32 49.4	112.9	33 31.0	112.0
28	28 35.1	116.2	29 17.9	115.4	30 0.5	114.6	30 42.8	113.8	31 24.7	112.9	32 6.3	112.1	32 47.7	111 3
32	27 53.1	115.4	28 35.7	114.6	29 18.0	113.8	30 0.0	112.9	30 41.6	111.1	31 23.0	111.3	32 4.1	110.4
36	27 10.9	114.6	27 53.1	113.8	28 35.1	113.0	29 16.9	112.1	29 58.3	111.3	30 39.4	110.5	31 20.3	109.6
40	26 28.3	113.8	27 10.3	113.0	27 52.1	112.2	28 33.6	111.4	29 14.8	110.5	29 55.6	109.7	30 36.2	108.8
44	25 45.5	113.0	26 27.3	112.2	27 8.8	111.4	27 50.1	110.6	28 31.0	109.7	29 11.7	108.9	29 52.0	108.1
48	25 2.5	112.2	25 44.0	111.4	26 25.3	110.6	27 6.3	109.8	27 47.0	109.0	28 27.5	108.1	29 7.6	107.3
52	24 19.2	111.5	25 0.5	110.7	25 41.5	109.9	26 22.3	109.1	27 2.8	108.2	27 43.1	107.4	28 23.0	106.5
3 56	23 35.7	110.7	24 16.8	109.9	24 57.6	109.1	25 38.2	108.3	26 18.4	107.5	26 58.4	106.6	27 38.2	105.8
4 0	22 52.0	110.0	23 32.8	109.2	24 13.4	108.4	24 53.8	107.6	25 33.9	106.7	26 13.7	105.9	26 53.2	105.1
4	22 8.0	109.2	22 48.6	108.4	23 29.1	107.6	24 9.3	106.8	24 49.1	106.0	25 28.7	105.2	26 8.1	104.3
8	21 23.9	108.5	22 4.3	107.7	22 44.6	106.9	23 24.5	106.1	24 4.2	105.3	24 43.7	104.5	25 22.9	103.6
12	20 39.6	107.8	21 19.8	107.0	21 59.9	106.2	22 39.7	105.4	23 19.3	104.6	23 58.4	103.7	24 37.5	102.9
16	19 55.1	107.1	20 35.1	106.3	21 15.0	105.5	21 54.6	104.7	22 34.0	103.9	23 13.1	103.0	23 52.0	102.2
20	19 10.4	106.4	19 50.4	105.6	20 30.0	104.8	21 9.5	104.0	21 48.7	103.2	22 27.6	102.3	23 6.4	101.5
24	18 25.6	105.7	19 5.3	104.9	19 44.8	104.1	20 24.1	103.3	21 3.1	102.5	21 42.0	101.6	22 20.6	100.8
28	17 40.6	105.0	18 20.2	104.2	18 59.5	103.4	19 38.7	102.6	20 17.6	101.8	20 56.2	101.0	21 34.8	100.1
32	16 55.5	104.3	17 34.9	103.5	18 14.1	102.7	18 53.1	101.9	19 31.8	101.1	20 10.4	100.3	20 48.8	99.4
36	16 10.3	103.6	16 49.4	102.8	17 28.6	102.0	18 7.4	101.2	18 46.1	100.4	19 24.5	99.6	20 2.8	98.8
40	15 24.9	102.9	16 3.9	102.1	16 42.9	101.3	17 21.6	100.5	18 0.2	99.7	18 38.5	98.9	19 16.6	98.1
44	14 39.4	102.2	15 18.3	101.4	15 57.2	100.7	16 35.8	99.9	17 14.2	99.1	17 52.4	98.2	18 30.4	97.4
48	13 53.7	101.6	14 32.5	100.8	15 11.2	100.0	15 49.8	99.2	16 28.0	98.4	17 6.2	97.6	17 44.1	96.8
52	13 8.0	100.9	13 46.7	100.1	14 25.2	99.3	15 3.6	98.5	15 41.8	97.7	16 19.9	96.9	16 57.8	96.1
4 56	12 22.2	100.2	13 0.8	99.4	13 39.2	98.7	14 17.5	97.9	14 55.6	97.1	15 33.6	96.3	16 11.5	95.5
5 0	11 36.2	99.6	12 14.7	98.8	12 53.1	98.0	13 31.3	97.2	14 9.3	96.4	14 47.2	95.6	15 25.0	94.8
4	10 50.1	98.9	11 28.7	98.1	12 6.9	97.4	12 45.0	96.6	13 22.9	95.8	14 0.8	95.0	14 38.5	94.2
8	10 4.1	98.3	10 42.4	97.5	11 20.6	96.7	11 58.7	95.9	12 36.6	95.1	13 14.4	94.3	13 52.0	93.5
12	9 17.9	97.6	9 56.1	96.8	10 34.2	96.1	11 12.2	95.3	11 50.1	94.5	12 27.8	93.7	13 5.4	92.9
16	8 31.7	97.0	9 9.8	96.2	9 47.8	95.4	10 25.8	94.6	11 3.6	93.8	11 41.3	93.0	12 18.9	92.2
20	7 45.4	96.3	8 23.4	95.5	9 1.4	94.8	9 39.2	94.0	10 17.0	93.2	10 54.7	92.4	11 32.2	91.6
24	6 59.0	95.7	7 37.0	94.9	8 14.9	94.1	8 52.7	93.3	9 30.4	92.6	10 8.1	91.8	10 45.6	91.0
28	6 12.6	95.1	6 50.5	94.3	7 28.4	93.5	8 6.2	92.7	8 43.8	91.9	9 21.5	91.1	9 59.0	90.3
32	5 26.1	94.4	6 4.0	93.6	6 41.8	92.9	7 19.6	92.1	7 57.3	91.3	8 34.9	90.5	9 12.3	89.7
36	4 39.6	93.8	5 17.4	93.0	5 55.2	92.2	6 33.0	91.4	7 10.6	90.7	7 48.2	89.9	8 25.7	89.1
40	3 53.0	93.2	4 30.8	92.4	5 8.7	91.6	5 46.4	90.8	6 24.0	90.0	7 1.6	89.2	7 39.1	88.5
44	3 6.4	92.5	3 44.3	91.7	4 22.1	91.0	4 59.8	90.2	5 37.4	89.4	6 15.0	88.6	6 52.6	87.8
48	2 19.8	91.9	2 57.7	91.1	3 35.4	90.3	4 13.1	89.5	4 50.8	88.8	5 28.4	88.0	6 5.9	87.2
52	1 33.2	91.3	2 11.1	90.5	2 48.8	89.7	3 26.5	88.9	4 4.1	88.1	4 41.8	87.3	5 19.4	86.6
5 56	0 46.6	90.6	1 24.4	89.9	2 2.2	89.1	2 39.9	88.3	3 17.5	87.5	3 55.2	86.7	4 32.9	86.0
6 0	0 0.0	90.0	0 37.8	89.2	1 15.5	88.5	1 53.3	87.7	2 31.0	86.9	3 8.7	86.1	3 46.3	85.3

NORTH DECLINATION.

Hour Angle.	7°		8°		9°		10°		11°		12°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0 0	58 0.0	180.0	59 0.0	180.0	60 0.0	180.0	61 0.0	180.0	62 0.0	180.0	63 0.0	180.0
4	57 59.3	178.1	58 59.3	178.1	59 59.2	178.0	60 59.2	177.9	61 59.1	177.9	62 59.0	177.8
8	57 57.1	176.3	58 57.0	176.2	59 56.9	176.1	60 56.8	175.9	61 56.6	175.8	62 56.5	175.6
12	57 53.8	174.4	58 53.0	174.2	59 52.8	174.1	60 52.5	173.9	61 52.3	173.7	62 52.0	173.5
16	57 48.0	172.5	58 47.7	172.3	59 47.3	172.1	60 46.9	171.9	61 46.5	171.6	62 46.0	171.4
20	57 41.2	170.7	58 40.7	170.4	59 40.1	170.2	60 39.6	169.9	61 38.9	169.6	62 38.2	169.3
24	57 33.9	168.9	58 32.2	168.6	59 31.4	168.3	60 30.5	167.9	61 29.7	167.6	62 28.7	167.2
28	57 23.1	167.0	58 22.2	166.7	59 21.2	166.3	60 20.1	165.9	61 18.9	165.6	62 17.6	165.2
32	57 11.9	165.2	58 10.7	164.8	59 9.3	164.4	60 7.9	164.0	61 6.4	163.6	62 4.8	163.1
36	56 59.4	163.5	57 57.9	163.0	58 56.2	162.6	59 54.4	162.1	60 52.5	161.6	61 50.5	161.1
40	56 45.4	161.7	57 43.5	161.2	58 41.4	160.7	59 39.2	160.2	60 37.0	159.7	61 34.5	159.1
44	56 30.1	159.9	57 27.8	159.4	58 25.4	158.9	59 22.8	158.4	60 20.1	157.8	61 17.2	157.1
48	56 13.4	158.2	57 10.7	157.7	58 7.9	157.1	59 4.9	156.5	60 1.7	155.9	60 58.3	155.2
52	55 55.4	156.5	56 52.4	155.9	57 49.1	155.4	58 45.6	154.7	59 42.0	154.1	60 38.1	153.3
0 56	55 36.2	154.9	56 32.7	154.2	57 28.9	153.6	58 25.0	153.0	59 20.9	152.3	60 16.5	151.5
1 0	55 15.9	153.2	56 11.9	152.6	57 7.6	151.9	58 3.3	151.2	58 58.6	150.5	59 53.6	149.7
4	54 54.2	151.6	55 49.7	150.9	56 45.1	150.3	57 40.1	149.5	58 35.0	148.7	59 29.5	147.9
8	54 31.4	150.0	55 26.5	149.3	56 21.3	148.6	57 15.8	147.9	58 10.2	147.0	59 4.1	146.2
12	54 7.5	148.5	55 2.1	147.7	55 56.4	147.0	56 50.5	146.2	57 44.2	145.4	58 37.6	144.5
16	53 42.6	146.9	54 36.7	146.2	55 30.5	145.4	56 24.0	144.6	57 17.2	143.8	58 10.0	142.9
20	53 16.7	145.4	54 10.3	144.7	55 3.5	143.9	55 56.4	143.1	56 49.1	142.2	57 41.3	141.3
24	52 49.7	143.9	53 42.8	143.2	54 35.5	142.4	55 28.0	141.5	56 20.0	140.6	57 11.6	139.7
28	52 21.8	142.5	53 14.4	141.7	54 6.6	140.9	54 58.5	140.0	55 50.0	139.1	56 41.0	138.2
32	51 52.9	141.1	52 44.9	140.3	53 36.6	139.4	54 28.0	138.6	55 19.0	137.6	56 9.4	136.7
36	51 23.2	139.7	52 14.8	138.9	53 5.9	138.0	53 56.8	137.1	54 47.2	136.2	55 37.0	135.2
40	50 52.6	138.3	51 43.7	137.5	52 34.3	136.6	53 24.5	135.7	54 14.4	134.8	55 3.7	133.8
44	50 21.2	137.0	51 11.7	136.2	52 1.8	135.3	52 51.7	134.4	53 41.0	133.4	54 29.8	132.4
48	49 49.0	135.7	50 39.0	134.8	51 28.6	134.0	52 17.9	133.0	53 6.6	132.1	53 54.9	131.1
52	49 16.0	134.4	50 5.6	133.6	50 54.7	132.7	51 43.4	131.7	52 31.7	130.8	53 19.4	129.8
1 56	48 42.4	133.2	49 31.4	132.3	50 20.1	131.4	51 8.3	130.5	51 56.0	129.5	52 43.2	128.5
2 0	48 8.1	132.0	48 56.6	131.1	49 44.8	130.2	50 32.5	129.2	51 19.7	128.3	52 6.4	127.2
4	47 33.1	130.8	48 21.2	129.9	49 8.9	129.0	49 56.1	128.0	50 42.8	127.0	51 29.0	126.0
8	46 57.4	129.6	47 45.1	128.7	48 32.2	127.8	49 18.9	126.8	50 5.2	125.8	50 50.9	124.8
12	46 21.2	128.5	47 8.4	127.5	47 55.1	126.6	48 41.4	125.7	49 27.2	124.7	50 12.5	123.7
16	45 44.4	127.3	46 31.2	126.4	47 17.4	125.5	48 3.3	124.5	48 48.6	123.5	49 33.4	122.5
20	45 7.1	126.2	45 53.4	125.3	46 39.2	124.4	47 24.6	123.4	48 9.5	122.5	48 53.8	121.4
24	44 29.3	125.2	45 15.1	124.2	46 0.5	123.3	46 45.4	122.3	47 29.8	121.4	48 13.7	120.3
28	43 50.9	124.1	44 36.3	123.2	45 21.2	122.2	46 5.8	121.3	46 49.8	120.3	47 33.3	119.3
32	43 12.1	123.1	43 57.1	122.1	44 41.6	121.2	45 25.8	120.3	46 9.4	119.3	46 52.4	118.3
36	42 32.7	122.0	43 17.3	121.1	44 1.4	120.2	44 45.2	119.2	45 28.4	118.3	46 11.1	117.2
40	41 52.9	121.0	42 37.2	120.1	43 20.9	119.2	44 4.4	118.2	44 47.2	117.3	45 29.5	116.3
44	41 12.8	120.1	41 56.7	119.1	42 40.1	118.2	43 23.1	117.3	44 5.6	116.3	44 47.5	115.3
48	40 32.2	119.1	41 15.7	118.2	41 58.8	117.2	42 41.4	116.3	43 23.6	115.3	44 5.2	114.3
52	39 51.3	118.1	40 34.5	117.2	41 17.2	116.3	41 59.5	115.4	42 41.3	114.4	43 22.6	113.4
2 56	39 10.0	117.2	39 52.8	116.4	40 35.2	115.4	41 17.2	114.4	41 58.7	113.5	42 39.6	112.5
3 0	38 28.3	116.3	39 10.9	115.4	39 52.9	114.5	40 34.5	113.5	41 15.7	112.6	41 56.4	111.6
4	37 46.4	115.4	38 28.6	114.5	39 10.4	113.6	39 51.7	112.7	40 32.5	111.7	41 12.8	110.7
8	37 4.1	114.5	37 46.0	113.6	38 27.5	112.7	39 8.5	111.8	39 49.1	110.8	40 29.2	109.9
12	36 21.5	113.7	37 3.2	112.8	37 44.3	111.9	38 25.1	110.9	39 5.4	110.0	39 45.3	109.0
16	35 38.7	112.8	36 20.0	111.9	37 1.0	111.0	37 41.4	110.1	38 21.4	109.2	39 1.0	108.2
20	34 55.6	112.0	35 36.6	111.1	36 17.2	110.2	36 57.5	109.3	37 37.3	108.3	38 16.6	107.4
24	34 12.2	111.2	34 53.0	110.3	35 33.4	109.4	36 13.4	108.4	36 52.9	107.5	37 32.0	106.6
28	33 28.6	110.3	34 9.1	109.5	34 49.2	108.6	35 29.0	107.6	36 8.3	106.7	36 47.2	105.8
32	32 44.8	109.5	33 25.1	108.7	34 5.0	107.8	34 44.5	106.8	35 23.6	105.9	36 2.0	105.0
36	32 0.7	108.8	32 40.8	107.9	33 20.5	107.0	33 59.7	106.1	34 38.6	105.1	35 17.1	104.2
40	31 16.4	108.0	31 56.3	107.1	32 35.8	106.2	33 14.9	105.3	33 53.6	104.4	34 31.9	103.4
44	30 32.0	107.2	31 11.6	106.3	31 50.9	105.4	32 29.8	104.5	33 8.3	103.6	33 46.4	102.7
48	29 47.4	106.4	30 26.8	105.6	31 5.8	104.7	31 44.6	103.8	32 22.9	102.9	33 0.9	102.0
52	29 2.6	105.7	29 41.8	104.8	30 20.7	103.9	30 59.3	103.1	31 37.4	102.1	32 15.2	101.2
3 56	28 17.6	104.9	28 56.6	104.1	29 35.3	103.2	30 13.7	102.3	30 51.8	101.4	31 29.4	100.5
4 0	27 32.5	104.2	28 11.4	103.4	28 49.9	102.5	29 28.1	101.6	30 6.0	100.7	30 43.5	99.8
4	26 47.2	103.5	27 25.9	102.6	28 4.3	101.8	28 42.4	100.9	29 20.1	100.0	29 57.5	99.1
8	26 1.8	102.8	26 40.4	101.9	27 18.6	101.1	27 56.5	100.2	28 34.1	99.3	29 11.4	98.4
12	25 16.2	102.1	25 54.7	101.2	26 32.8	100.4	27 10.6	99.5	27 48.1	98.6	28 25.3	97.7
16	24 30.5	101.4	25 8.9	100.5	25 46.9	99.7	26 24.6	98.8	27 2.0	97.9	27 39.0	97.0
20	23 44.9	100.7	24 23.0	99.8	25 0.9	99.0	25 38.5	98.1	26 15.8	97.2	26 52.7	96.4
24	22 59.0	100.0	23 37.0	99.1	24 14.8	98.3	24 52.3	97.4	25 29.5	96.6	26 6.3	95.7
28	22 13.0	99.3	22 50.9	98.5	23 28.6	97.6	24 6.0	96.8	24 43.1	95.9	25 19.9	95.0
32	21 26.9	98.6	22 4.8	97.8	22 42.4	96.9	23 19.6	96.1	23 56.7	95.2	24 33.4	94.4
36	20 40.8	97.9	21 18.5	97.1	21 56.0	96.3	22 33.3	95.4	23 10.2	94.6	23 46.9	93.7
40	19 54.6	97.3	20 32.2	96.4	21 9.6	95.6	21 46.8	94.8	22 23.7	93.9	23 0.3	93.1
44	19 8.3	96.6	19 45.8	95.8	20 23.2	94.9	21 0.3	94.1	21 37.2	93.3	22 13.8	92.4
48	18 21.9	96.0	18 59.4	95.1	19 36.7	94.3	20 13.8	93.5	20 50.6	92.6	21 27.2	91.8
52	17 35.5	95.3	18 12.9	94.5	18 50.2	93.6	19 27.2	92.8	20 4.0	92.0	20 40.6	91.1
4 56	16 49.1	94.7	17 26.5	93.8	18 3.6	93.0	18 40.7	92.2	19 17.4	91.3	19 53.9	90.5
5 0	16 2.6	94.0	16 39.9	93.2	17 17.1	92.4	17 54.1	91.5	18 30.8	90.7	19 7.3	89.9
4	15 16.0	93.4	15 53.4	92.5	16 30.5	91.7	17 7.5	90.9	17 44.1	90.1	18 20.7	89.2
8	14 29.5	92.7	15 6.7	91.9	15 43.9	91.1	16 20.8	90.3	16 57.6	89.4	17 34.1	88.6
12	13 42.8	92.1	14 20.1	91.3	14 57.2	90.5	15 34.2	89.6	16 10.9	88.8	16 47.5	88.0
16	12 56.2	91.4	13 33.5	90.6	14 10.6	89.8	14 47.5	89.0	15 24.3	88.2	16 0.9	87.4
20	12 9.6	90.8	12 46.8	90.0	13 24.0	89.2	14 0.9	88.4	14 37.7	87.6	15 14.3	86.8
24	11 23.0	90.2	12 0.3	89.4	12 37.3	88.6	13 14.3	87.8	13 51.1	87.0	14 27.7	86.1
28	10 36.4	89.5	11 13.7	88.7	11 50.8	87.9	12 27.8	87.1	13 4.7	86.3	13 41.3	85.5
32	9 49.8	88.9	10 27.0	88.1	11 4.2	87.3	11 41.2	86.5	12 18.0	85.7	12 54.8	84.9
36	9 3.1	88.3	9 40.4	87.5	10 17.6	86.7	10 54.7	85.9	11 31.6	85.1	12 8.4	84.3
40	8 16.5	87.7	8 53.8	86.9	9 31.0	86.1	10 8.2	85.3	10 45.2	84.5	11 22.0	83.7
44	7 30.0	87.0	8 7.3	86.3	8 44.6	85.5	9 21.7	84.7	9 58.7	83.9	10 35.7	83.1
48	6 43.4	86.4	7 20.8	85.6	7 58.1	84.8	8 35.3	84.1	9 12.4	83.3	9 49.4	82.5
52	5 57.0	85.8	6 34.4	85.0	7 11.7	84.2	7 48.9	83.4	8 26.1	82.6	9 3.2	81.8
5 56	5 10.4	85.2	5 47.9	84.4	6 25.3	83.6	7 2.7	82.8	7 39.9	82.0	8 17.1	81.2
6 0	4 24.0	84.6	5 1.5	83.8	5 39.0	83.0	6 16.4	82.2	6 53.8	81.4	7 31.1	80.6

NORTH DECLINATION.

Hour Angle.	13°		14°		15°		16°		17°		18°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0 0	64 0.0	180.0	65 0.0	180.0	66 0.0	180.0	67 0.0	180.0	68 0.0	180.0	69 0.0	180.0
4	63 59.0	177.7	64 59.0	177.6	65 58.9	177.6	66 58.9	177.5	67 59.0	177.4	68 59.0	177.3
8	63 56.4	175.5	64 56.3	175.4	65 56.2	175.2	66 56.0	175.1	67 55.9	174.8	68 55.8	174.7
12	63 51.8	173.3	64 51.6	173.2	65 51.3	172.9	66 51.0	172.6	67 50.7	172.3	68 50.4	172.1
16	63 45.6	171.1	64 45.1	170.9	65 44.6	170.5	66 44.0	170.2	67 43.5	169.8	68 42.9	169.5
20	63 37.5	169.0	64 36.8	168.6	65 36.0	168.2	66 35.1	167.8	67 34.2	167.4	68 33.3	166.9
24	63 27.8	166.8	64 26.7	166.4	65 25.7	165.9	66 24.4	165.5	67 23.1	164.9	68 21.8	164.3
28	63 16.2	164.6	64 14.9	164.2	65 13.4	163.7	66 11.7	163.1	67 9.9	162.5	68 8.1	161.8
32	63 3.1	162.6	64 1.3	162.0	64 59.4	161.5	65 57.3	160.8	66 55.1	160.1	67 52.7	159.4
36	62 48.4	160.5	63 46.1	159.9	64 43.7	159.3	65 41.1	158.6	66 38.3	157.8	67 35.4	157.0
40	62 32.0	158.5	61 39.2	157.8	64 26.4	157.1	65 23.2	156.4	66 19.9	155.6	67 16.3	154.7
44	62 14.1	156.5	63 10.9	155.8	64 7.5	155.0	65 3.8	154.2	65 59.8	153.4	66 55.6	152.4
48	61 54.7	154.5	62 51.0	153.8	63 47.0	153.0	64 42.7	152.1	65 38.1	151.2	66 33.1	150.2
52	61 34.0	152.6	62 29.7	151.8	63 25.1	151.0	64 20.2	150.1	65 14.9	149.1	66 9.3	148.1
0 56	61 11.8	150.7	62 7.0	149.9	63 1.8	149.0	63 56.2	148.1	64 50.1	147.0	65 43.8	146.0
1 0	60 48.4	148.9	61 42.9	148.0	62 37.1	147.1	63 30.8	146.1	64 24.1	145.1	65 17.1	143.9
4	60 23.7	147.1	61 17.6	146.2	62 11.1	145.2	63 4.2	144.2	63 56.8	143.2	64 49.0	142.0
8	59 57.7	145.3	60 51.0	144.4	61 43.9	143.4	62 36.3	142.4	63 28.3	141.3	64 19.7	140.1
12	59 30.6	143.6	60 23.2	142.6	61 15.5	141.6	62 7.2	140.6	62 58.3	139.4	63 49.1	138.2
16	59 2.4	141.9	59 54.4	140.9	60 46.0	139.9	61 37.0	138.8	62 27.6	137.7	63 17.5	136.5
20	58 33.2	140.3	59 24.6	139.3	60 15.6	138.2	61 5.9	137.1	61 55.7	136.0	62 44.9	134.7
24	58 2.8	138.7	58 53.7	137.7	59 44.0	136.6	60 33.7	135.5	61 22.8	134.3	62 11.4	133.1
28	57 31.6	137.2	58 21.8	136.1	59 11.5	135.1	60 0.5	133.9	60 49.0	132.7	61 36.8	131.5
32	56 59.4	135.7	57 49.0	134.6	58 38.1	133.5	59 26.5	132.4	60 14.3	131.2	61 1.5	129.9
36	56 26.5	134.2	57 15.4	133.1	58 3.9	132.0	58 51.6	130.9	59 38.8	129.7	60 25.2	128.4
40	55 52.6	132.8	56 41.0	131.7	57 28.8	130.6	58 16.0	129.4	59 2.5	128.2	59 48.4	127.0
44	55 18.1	131.4	56 5.9	130.3	56 53.1	129.2	57 39.6	128.0	58 25.6	126.8	59 10.7	125.5
48	54 42.7	130.0	55 29.9	128.9	56 16.6	127.8	57 2.5	126.7	57 47.8	125.5	58 32.5	124.2
52	54 6.7	128.7	54 53.3	127.6	55 39.4	126.5	56 24.8	125.3	57 9.5	124.1	57 53.6	122.9
1 56	53 29.9	127.4	54 16.1	126.3	55 1.7	125.2	55 46.5	124.0	56 30.7	122.8	57 14.1	121.6
2 0	52 52.6	126.2	53 38.2	125.1	54 23.3	124.0	55 7.6	122.8	55 51.3	121.6	56 34.2	120.3
4	52 14.6	125.0	52 59.8	123.9	53 44.3	122.8	54 28.1	121.6	55 11.2	120.4	55 53.6	119.1
8	51 36.1	123.8	52 20.8	122.7	53 4.8	121.6	53 48.1	120.4	54 30.8	119.2	55 12.7	118.0
12	50 57.1	122.6	51 41.3	121.5	52 24.8	120.4	53 7.6	119.2	53 49.8	118.0	54 31.3	116.8
16	50 17.6	121.5	51 1.3	120.4	51 44.4	119.3	52 26.7	118.1	53 8.5	116.9	53 49.5	115.7
20	49 37.6	120.4	50 20.9	119.3	51 3.5	118.2	51 45.4	117.0	52 26.7	115.8	53 7.3	114.6
24	48 57.1	119.3	49 40.0	118.2	50 22.2	117.1	51 3.7	116.0	51 44.6	114.8	52 24.7	113.6
28	48 16.3	118.2	48 58.7	117.2	49 40.5	116.1	50 21.6	114.9	51 2.0	113.8	51 41.9	112.6
32	47 35.0	117.2	48 17.1	116.1	48 58.5	115.1	49 39.2	113.9	50 19.2	112.8	50 58.7	111.6
36	46 53.3	116.2	47 34.9	115.1	48 16.0	114.1	48 56.4	112.9	49 36.1	111.8	50 15.2	110.6
40	46 11.3	115.2	46 52.6	114.2	47 33.2	113.1	48 13.3	112.0	48 52.6	110.8	49 31.3	109.7
44	45 29.0	114.3	46 9.9	113.2	46 50.2	112.1	47 29.9	111.0	48 8.9	109.9	48 47.3	108.7
48	44 46.3	113.3	45 26.9	112.3	46 6.9	111.2	46 46.2	110.1	47 24.9	109.0	48 3.0	107.8
52	44 3.4	112.4	44 43.6	111.4	45 23.3	110.3	46 2.3	109.2	46 40.7	108.1	47 18.6	107.0
2 56	43 20.1	111.5	44 0.0	110.5	44 39.4	109.4	45 18.1	108.3	45 56.2	107.2	46 33.8	106.1
3 0	42 36.5	110.6	43 16.2	109.6	43 55.3	108.5	44 33.8	107.4	45 11.7	106.4	45 48.8	105.2
4	41 52.8	109.7	42 32.1	108.7	43 11.0	107.7	43 49.2	106.6	44 26.8	105.5	45 3.8	104.4
8	41 8.8	108.9	41 47.9	107.9	42 26.4	106.8	43 4.4	105.8	43 41.8	104.7	44 18.6	103.6
12	40 24.5	108.0	41 3.5	107.0	41 41.7	106.0	42 19.4	104.9	42 56.6	103.9	43 33.2	102.8
16	39 40.1	107.2	40 18.7	106.2	40 56.8	105.2	41 34.3	104.1	42 11.2	103.1	42 47.6	102.0
20	38 55.4	106.4	39 33.8	105.4	40 11.7	104.4	40 49.0	103.3	41 25.8	102.3	42 2.0	101.2
24	38 10.6	105.6	38 48.8	104.6	39 26.5	103.6	40 3.6	102.6	40 40.1	101.5	41 16.2	100.5
28	37 25.6	104.8	38 3.6	103.8	38 41.1	102.8	39 18.0	101.8	39 54.4	100.8	40 30.3	99.5
32	36 40.4	104.0	37 18.2	103.0	37 55.5	102.1	38 32.3	101.0	39 8.5	100.0	39 44.3	99.0
36	35 55.1	103.3	36 32.7	102.3	37 9.9	101.3	37 46.5	100.3	38 22.5	99.3	38 58.2	98.3
40	35 9.7	102.5	35 47.1	101.5	36 24.1	100.6	37 0.5	99.6	37 36.5	98.6	38 12.0	97.5
44	34 24.1	101.8	35 1.4	100.8	35 38.2	99.8	36 14.5	98.8	36 50.3	97.9	37 25.7	96.8
48	33 38.4	101.0	34 15.6	100.1	34 52.2	99.1	35 28.4	98.1	36 4.1	97.2	36 39.4	96.1
52	32 52.5	100.3	33 29.6	99.4	34 6.1	98.4	34 42.2	97.4	35 17.8	96.5	35 53.0	95.5
3 56	32 6.6	99.6	32 43.5	98.6	33 20.0	97.7	33 56.0	96.7	34 31.5	95.8	35 6.6	94.8
4 0	31 20.6	98.9	31 57.3	97.9	32 33.6	97.0	33 9.6	96.1	33 45.1	95.1	34 20.1	94.1
4	30 34.6	98.2	31 11.2	97.3	31 47.4	96.3	32 23.2	95.4	32 58.6	94.4	33 33.6	93.5
8	29 48.3	97.5	30 24.9	96.7	31 1.0	95.6	31 36.7	94.7	32 12.1	93.8	32 47.0	92.8
12	29 2.1	96.8	29 38.5	95.9	30 14.6	95.0	30 50.2	94.0	31 25.5	93.1	32 0.4	92.1
16	28 15.7	96.1	28 52.1	95.2	29 28.1	94.3	30 3.7	93.4	30 38.9	92.4	31 13.8	91.5
20	27 29.4	95.5	28 5.6	94.7	28 41.6	93.7	29 17.1	92.7	29 52.4	91.8	30 27.2	90.9
24	26 42.9	94.8	27 19.1	94.1	27 55.0	93.0	28 30.5	92.1	29 5.7	91.2	29 40.6	90.2
28	25 56.4	94.1	26 32.6	93.3	27 8.3	92.4	27 43.9	91.4	28 19.1	90.5	28 53.9	89.6
32	25 9.8	93.5	25 46.1	92.6	26 21.9	91.7	26 57.4	90.8	27 32.5	89.9	28 7.3	89.0
36	24 23.3	92.8	24 59.4	92.0	25 35.3	91.1	26 10.7	90.2	26 45.9	89.3	27 20.7	88.3
40	23 36.7	92.2	24 12.8	91.3	24 48.6	90.4	25 24.1	89.5	25 59.2	88.6	26 34.1	87.7
44	22 50.1	91.5	23 26.2	90.7	24 2.0	89.8	24 37.5	88.9	25 12.6	88.0	25 47.5	87.1
48	22 3.5	90.9	22 39.6	90.0	23 15.4	89.2	23 50.8	88.3	24 26.0	87.4	25 0.9	86.5
52	21 16.9	90.3	21 53.0	89.4	22 28.8	88.6	23 4.3	87.7	23 39.5	86.8	24 14.4	85.9
4 56	20 30.2	89.6	21 6.3	88.8	21 42.1	87.9	22 17.6	87.1	22 52.9	86.2	23 27.9	85.3
5 0	19 43.6	89.0	20 19.7	88.2	20 55.6	87.3	21 31.2	86.5	22 6.5	85.6	22 41.5	84.7
4	18 57.0	88.4	19 33.1	87.6	20 9.0	86.7	20 44.6	85.8	21 20.0	85.0	21 55.1	84.1
8	18 10.4	87.8	18 46.5	86.9	19 22.4	86.1	19 58.1	85.2	20 33.5	84.4	21 8.7	83.5
12	17 23.8	87.2	18 0.0	86.3	18 36.0	85.5	19 11.7	84.6	19 47.2	83.8	20 22.4	82.9
16	16 37.3	86.6	17 13.5	85.7	17 49.5	84.9	18 25.2	84.0	19 0.8	83.2	19 36.2	82.3
20	15 50.8	85.9	16 27.1	85.1	17 3.1	84.3	17 38.9	83.4	18 14.6	82.6	18 50.0	81.7
24	15 4.2	85.3	15 40.6	84.5	16 16.8	83.7	16 52.6	82.8	17 28.4	82.0	18 3.9	81.1
28	14 17.8	84.7	14 54.2	83.9	15 30.4	83.1	16 6.4	82.2	16 42.3	81.4	17 17.9	80.6
32	13 31.3	84.1	14 7.8	83.3	14 44.1	82.5	15 20.2	81.6	15 56.2	80.8	16 31.9	80.0
36	12 45.0	83.5	13 21.6	82.7	13 58.0	81.9	14 34.1	81.0	15 10.2	80.2	15 46.0	79.4
40	11 58.8	82.9	12 35.3	82.1	13 11.8	81.3	13 48.1	80.4	14 24.2	79.6	15 0.2	78.8
44	11 12.5	82.3	11 49.2	81.5	12 25.7	80.7	13 2.2	79.8	13 38.5	79.0	14 14.5	78.2
48	10 26.3	81.7	11 3.2	80.9	11 39.8	80.1	12 16.3	79.2	12 52.7	78.4	13 29.0	77.6
52	9 40.2	81.0	10 17.1	80.3	10 53.9	79.5	11 30.6	78.6	12 7.1	77.8	12 43.5	77.0
5 56	8 54.2	80.4	9 31.2	79.7	10 8.1	78.9	10 44.8	78.0	11 21.6	77.2	11 58.1	76.4
6 0	8 8.3	79.8	8 45.4	79.0	9 22.4	78.2	9 59.5	77.4	10 36.1	76.6	11 12.9	75.8

5	56	5	10.4	85.2	5	47.9	84.4	6	25.3	83.6	7	2.7	82.8	7	39.9	82.0	8	17.2	81.2				
6	0	4	24.0	84.6	5	1.5	83.8	5	39.0	83.0	6	16.4	82.2	6	53.8	81.4	7	31.1	80.6				

NORTH DECLINATION.

Hour Angle.		19°		20°		21°		22°		23°		24°	
		Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h.	m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0	0	70 0.0	180.0	71 0.0	180.0	72 0.0	180.0	73 0.0	180.0	74 0.0	180.0	75 0.0	180.0
	4	69 59.0	177.2	70 59.0	177.1	71 58.9	177.0	72 58.8	176.8	73 58.7	176.6	74 58.6	176.4
	8	69 55.7	174.4	70 55.5	174.2	71 55.3	174.0	72 55.0	173.6	73 54.7	173.3	74 54.3	172.9
	12	69 50.1	171.7	70 49.7	171.4	71 49.2	171.0	72 48.6	170.5	73 48.0	170.0	74 47.2	169.5
	16	69 42.3	169.0	70 41.5	168.6	71 40.7	168.1	72 39.7	167.4	73 38.6	166.8	74 37.3	166.1
	20	69 32.3	166.4	70 31.1	165.8	71 29.8	165.2	72 28.4	164.4	73 26.7	163.6	74 24.9	162.8
	24	69 20.3	163.7	70 18.7	163.0	71 16.7	162.3	72 14.7	161.4	73 12.4	160.6	74 9.8	159.6
	28	69 6.1	161.2	70 3.9	160.4	71 1.4	159.5	71 58.7	158.6	72 55.7	157.6	73 52.3	156.4
	32	68 50.2	158.6	69 47.3	157.8	70 44.1	156.8	71 40.7	155.8	72 36.8	154.6	73 32.5	153.3
	36	68 32.2	156.2	69 28.6	155.2	70 24.7	154.2	71 20.4	153.1	72 15.7	151.8	73 10.4	150.4
	40	68 12.5	153.7	69 8.3	152.7	70 3.5	151.6	70 58.4	150.4	71 52.8	149.1	72 46.5	147.6
	44	67 51.0	151.4	68 45.9	150.3	69 40.4	149.2	70 34.4	147.9	71 27.9	146.5	72 20.5	144.9
	48	67 27.9	149.1	68 22.0	148.0	69 15.7	146.8	70 8.8	145.4	71 1.4	144.0	71 53.2	142.4
	52	67 3.3	146.9	67 56.6	145.8	68 49.4	144.5	69 41.5	143.1	70 33.0	141.6	71 23.5	139.9
0	56	66 37.1	144.7	67 29.5	143.6	68 21.4	142.3	69 12.8	140.8	70 3.4	139.2	70 52.9	137.6
1	0	66 9.5	142.7	67 1.2	141.5	67 52.3	140.1	68 42.6	138.6	69 32.2	137.0	70 20.7	135.3
	4	65 40.7	140.8	66 32.6	139.4	67 21.7	138.1	68 11.2	136.6	68 59.8	134.9	69 47.3	133.2
	8	65 10.5	138.8	66 0.6	137.5	66 49.9	136.1	67 38.5	134.6	68 26.3	132.9	69 12.8	131.2
	12	64 39.3	137.0	65 28.5	135.6	66 17.0	134.2	67 4.7	132.6	67 51.4	131.0	68 37.2	129.3
	16	64 6.9	135.2	64 55.4	133.8	65 43.1	132.4	66 30.0	130.8	67 16.0	129.2	68 0.7	127.4
	20	63 33.5	133.4	64 21.2	132.1	65 8.1	130.6	65 54.2	129.0	66 39.3	127.4	67 23.2	125.7
	24	62 59.3	131.8	63 46.2	130.4	64 32.3	128.9	65 17.6	127.4	66 1.9	125.7	66 45.6	124.0
	28	62 24.0	130.2	63 10.2	128.8	63 55.5	127.3	64 40.0	125.7	65 23.6	124.1	66 5.8	122.4
	32	61 48.0	128.6	62 33.5	127.2	63 18.1	125.7	64 1.9	124.2	64 44.7	122.5	65 26.2	120.8
	36	61 11.1	127.1	61 55.9	125.7	62 39.8	124.2	63 22.9	122.7	64 4.9	121.1	64 45.7	119.4
	40	60 33.6	125.6	61 17.8	124.3	62 1.0	122.8	62 43.4	121.2	63 24.8	119.6	64 4.9	118.0
	44	59 55.3	124.2	60 38.8	122.8	61 21.4	121.4	62 3.2	119.9	62 43.9	118.3	63 23.4	116.6
	48	59 16.4	122.9	59 59.4	121.5	60 41.4	120.0	61 22.5	118.5	62 2.6	117.0	62 41.5	115.3
1	52	58 36.9	121.5	59 19.3	120.2	60 0.7	118.7	60 41.3	117.2	61 20.9	115.7	61 59.2	114.1
	56	57 56.9	120.3	58 38.7	118.9	59 19.5	117.5	59 59.6	116.0	60 38.6	114.5	61 16.4	112.9
2	0	57 16.4	119.0	57 57.7	117.7	58 38.0	116.3	59 17.5	114.8	59 56.0	113.3	60 33.2	111.7
	4	56 35.4	117.8	57 16.1	116.5	57 55.9	115.1	58 34.9	113.6	59 12.9	112.1	59 49.8	110.6
	8	55 54.0	116.7	56 34.3	115.3	57 13.6	114.0	57 52.1	112.5	58 29.5	111.0	59 5.9	109.5
	12	55 12.1	115.5	55 51.9	114.2	56 30.8	112.9	57 8.7	111.4	57 45.8	110.0	58 21.8	108.5
	16	54 29.8	114.4	55 9.2	113.1	55 47.7	111.8	56 25.1	110.4	57 1.9	108.9	57 37.5	107.4
	20	53 47.2	113.4	54 26.1	112.1	55 4.2	110.8	55 41.3	109.4	56 17.7	107.9	56 52.8	106.5
	24	53 4.2	112.3	53 42.8	111.1	54 20.4	109.7	54 57.3	108.4	55 33.2	107.0	56 8.0	105.5
	28	52 20.9	111.3	52 59.1	110.1	53 36.4	108.8	54 12.9	107.4	54 48.5	106.0	55 23.0	104.6
	32	51 37.4	110.3	52 15.1	109.1	52 52.1	107.8	53 28.3	106.5	54 3.6	105.1	54 37.9	103.7
	36	50 53.5	109.4	51 31.0	108.1	52 7.6	106.9	52 43.5	105.6	53 18.5	104.2	53 52.4	102.8
	40	50 9.4	108.4	50 46.5	107.2	51 22.9	106.0	51 58.5	104.7	52 33.2	103.3	53 6.9	101.9
	44	49 25.0	107.5	50 1.9	106.3	50 38.0	105.1	51 13.3	103.8	51 47.7	102.5	52 21.2	101.1
	48	48 40.4	106.6	49 17.1	105.4	49 52.8	104.2	50 27.9	102.9	51 2.1	101.6	51 35.4	100.3
	52	47 55.7	105.8	48 32.1	104.6	49 7.6	103.4	49 42.4	102.1	50 16.4	100.8	50 49.4	99.5
2	56	47 10.7	104.9	47 46.8	103.7	48 22.1	102.5	48 56.7	101.3	49 30.5	100.0	50 3.4	98.7
3	0	46 25.5	104.1	47 1.4	102.9	47 36.5	101.7	48 10.9	100.5	48 44.5	99.2	49 17.2	98.0
	4	45 40.2	103.3	46 15.9	102.1	46 50.8	100.9	47 25.0	99.7	47 58.4	98.5	48 31.0	97.2
	8	44 54.7	102.5	45 30.2	101.3	46 4.9	100.1	46 39.0	98.9	47 12.3	97.7	47 44.7	96.5
	12	44 9.2	101.7	44 44.5	100.5	45 19.0	99.4	45 52.9	98.2	46 26.0	97.0	46 58.3	95.8
	16	43 23.4	100.9	43 58.4	99.8	44 32.9	98.6	45 6.6	97.5	45 39.6	96.3	46 11.9	95.1
	20	42 37.6	100.1	43 12.5	99.0	43 46.8	97.9	44 20.4	96.7	44 53.4	95.6	45 25.4	94.4
	24	41 51.7	99.4	42 26.5	98.3	43 0.6	97.2	43 34.0	96.0	44 0.9	94.9	44 38.9	93.7
	28	41 5.5	98.7	41 40.3	97.6	42 14.3	96.5	42 47.7	95.3	43 20.4	94.2	43 52.4	93.0
	32	40 19.5	97.9	40 54.0	96.8	41 27.9	95.8	42 1.2	94.6	42 33.9	93.5	43 5.8	92.3
	36	39 33.2	97.2	40 7.6	96.1	40 41.4	95.1	41 14.7	94.0	41 47.3	92.8	42 19.2	91.7
	40	38 47.0	96.5	39 21.3	95.4	39 55.0	94.4	40 28.2	93.3	41 0.8	92.2	41 32.6	91.1
	44	38 0.6	95.8	38 34.8	94.8	39 8.5	93.7	39 41.6	92.6	40 14.1	91.5	40 46.0	90.4
	48	37 14.1	95.1	37 48.4	94.1	38 22.0	93.0	38 55.1	92.0	39 27.5	90.9	39 59.4	89.8
	52	36 27.6	94.4	37 1.8	93.4	37 35.4	92.4	38 8.4	91.3	38 40.9	90.3	39 12.8	89.2
3	56	35 41.2	93.8	36 15.3	92.8	36 48.8	91.7	37 21.9	90.7	37 54.3	89.6	38 26.1	88.5
4	0	34 54.6	93.1	35 28.7	92.1	36 2.2	91.1	36 35.1	90.0	37 7.7	89.0	37 39.5	87.9
	4	34 8.1	92.5	34 42.1	91.5	35 15.6	90.5	35 48.6	89.4	36 21.1	88.4	36 52.9	87.4
	8	33 21.4	91.8	33 55.5	90.8	34 28.9	89.8	35 1.9	88.8	35 34.4	87.8	36 6.3	86.7
	12	32 34.8	91.2	33 8.9	90.2	33 42.3	89.2	34 15.3	88.2	34 47.8	87.2	35 19.6	86.1
	16	31 48.2	90.5	32 22.2	89.6	32 55.7	88.6	33 28.7	87.6	34 1.3	86.6	34 33.3	85.5
	20	31 1.6	89.9	31 35.6	88.9	32 9.1	88.0	32 42.2	87.0	33 14.8	86.0	33 46.8	85.0
	24	30 15.0	89.3	30 49.0	88.3	31 22.5	87.3	31 55.6	86.4	32 28.3	85.4	33 0.4	84.4
	28	29 28.3	88.7	30 2.3	87.7	30 35.9	86.7	31 9.1	85.8	31 41.8	84.8	32 14.0	83.8
	32	28 41.7	88.0	29 15.7	87.1	29 49.3	86.1	30 22.6	85.2	30 55.4	84.2	31 27.7	83.2
	36	27 55.2	87.4	28 29.2	86.5	29 2.9	85.5	29 36.2	84.6	30 9.0	83.6	30 41.4	82.7
	40	27 8.6	86.8	27 42.7	85.9	28 16.4	84.9	28 49.7	84.0	29 22.8	83.0	29 55.3	82.1
	44	26 22.1	86.2	26 56.2	85.3	27 30.0	84.4	28 3.4	83.4	28 36.4	82.5	29 9.0	81.5
	48	25 35.5	85.6	26 9.8	84.7	26 43.6	83.8	27 17.1	82.8	27 50.2	81.9	28 23.0	81.0
	52	24 49.0	85.0	25 23.3	84.1	25 57.2	83.2	26 30.9	82.3	27 4.1	81.3	27 37.0	80.4
4	56	24 2.6	84.4	24 37.0	83.5	25 11.0	82.6	25 44.7	81.7	26 18.1	80.8	26 51.0	79.8
5	0	23 16.3	83.8	23 50.7	82.9	24 24.8	82.0	24 58.6	81.1	25 32.1	80.2	26 5.2	79.3
	4	22 29.9	83.2	23 4.4	82.3	23 38.6	81.4	24 12.6	80.5	24 46.1	79.6	25 19.4	78.7
	8	21 43.6	82.6	22 18.2	81.8	22 52.6	80.9	23 26.6	80.0	24 0.3	79.1	24 33.7	78.2
	12	20 57.4	82.0	21 32.1	81.2	22 6.6	80.3	22 40.8	79.4	23 14.6	78.5	23 48.2	77.6
	16	20 11.3	81.5	20 46.1	80.6	21 20.7	79.7	21 54.9	78.8	22 28.9	77.9	23 2.6	77.0
	20	19 25.2	80.9	20 0.2	80.0	20 34.9	79.1	21 9.3	78.3	21 43.4	77.4	22 17.2	76.5
	24	18 39.2	80.3	19 14.3	79.4	19 49.1	78.6	20 23.6	77.7	20 58.0	76.8	21 32.0	75.9
	28	17 53.3	79.7	18 28.5	78.9	19 3.4	78.0	19 38.1	77.1	20 12.6	76.3	20 46.8	75.4
	32	17 7.4	79.1	17 42.8	78.3	18 17.8	77.4	18 52.7	76.6	19 27.4	75.7	20 1.7	74.8
	36	16 21.7	78.5	16 57.2	77.7	17 32.4	76.9	18 7.5	76.0	18 42.3	75.1	19 16.8	74.3
	40	15 36.1	78.0	16 11.7	77.1	16 47.0	76.3	17 22.3	75.4	17 57.2	74.6	18 32.0	73.7
	44	14 50.5	77.4	15 26.3	76.5	16 1.8	75.7	16 37.2	74.9	17 12.4	74.0	17 47.3	73.2
	48	14 5.0	76.8	14 41.0	76.0	15 16.7	75.1	15 52.3	74.3	16 27.6	73.4	17 2.8	72.6
	52	13 19.8	76.2	13 55.8	75.4	14 31.7	74.5	15 7.4	73.7	15 43.0	72.9	16 18.3	72.0
5	56	12 34.5	75.6	13 10.7	74.8	13 46.7	74.0	14 22.7	73.1	14 58.4	72.3	15 34.0	71.5
6	0	11 49.4	75.0	12 25.8	74.2	13 2.1	73.4	13 38.2	72.6	14 14.1	71.8	14 49.8	70.9

5	56	8	54.2	80.4	9	31.2	79.7	10	8.1	78.9	10	44.8	78.0	11	21.6	77.1	11	58.5	76.2				
6	0	8	8.3	79.8	8	45.4	79.0	9	22.4	78.2	9	59.3	77.4	10	36.1	76.6	11	12.9	75.8				

SOUTH DECLINATION

Hour Angle.	0°		1°		2°		3°		4°		5°		6°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0 0	51 0.0	180.0	50 0.0	180.0	49 0.0	180.0	48 0.0	180.0	47 0.0	180.0	46 0.0	180.0	45 0.0	180.0
4	50 59.4	178.4	49 59.4	178.4	48 59.5	178.5	47 59.5	178.5	46 59.5	178.5	45 59.5	178.6	44 59.5	178.6
8	50 57.4	176.8	49 57.5	176.9	48 57.5	177.0	47 57.6	177.0	46 57.6	177.1	45 57.7	177.1	44 57.8	177.2
12	50 54.2	175.2	49 54.3	175.3	48 54.5	175.4	47 54.6	175.5	46 54.7	175.6	45 54.8	175.7	44 54.9	175.8
16	50 49.7	173.7	49 49.9	173.8	48 50.1	173.9	47 50.3	174.0	46 50.5	174.2	45 50.7	174.3	44 50.9	174.4
20	50 43.9	172.1	49 44.3	172.3	48 44.6	172.4	47 44.8	172.6	46 45.1	172.7	45 45.5	172.9	44 45.8	173.0
24	50 36.8	170.5	49 37.3	170.7	48 37.8	170.9	47 38.3	171.1	46 38.7	171.3	45 39.1	171.4	44 39.5	171.6
28	50 28.5	169.0	49 29.2	169.2	48 29.8	169.4	47 30.4	169.6	46 31.0	169.8	45 31.6	170.0	44 32.1	170.2
32	50 19.0	167.4	49 19.8	167.7	48 20.7	167.9	47 21.4	168.2	46 22.2	168.4	45 22.9	168.6	44 23.7	168.8
36	50 8.2	165.9	49 9.3	166.2	48 10.4	166.4	47 11.3	166.7	46 12.3	167.0	45 13.2	167.2	44 14.1	167.5
40	49 56.2	164.4	48 57.6	164.7	47 58.8	165.0	47 0.0	165.3	46 1.2	165.6	45 2.3	165.8	44 3.4	166.1
44	49 43.1	162.8	48 44.7	163.2	47 46.2	163.5	46 47.6	163.8	45 49.0	164.2	44 50.4	164.5	43 51.7	164.8
48	49 28.7	161.3	48 30.6	161.7	47 32.3	162.1	46 34.1	162.4	45 35.7	162.8	44 37.3	163.1	43 38.9	163.4
52	49 13.2	159.9	48 15.4	160.3	47 17.4	160.7	46 19.4	161.0	45 21.3	161.4	44 23.2	161.7	43 25.0	162.1
0 56	48 56.6	158.4	47 59.0	158.8	47 1.4	159.2	46 3.7	159.6	45 5.9	160.0	44 8.1	160.4	43 10.1	160.7
1 0	48 38.9	156.9	47 41.7	157.4	46 44.3	157.8	45 46.9	158.3	44 49.4	159.7	43 51.9	159.1	42 54.2	159.4
4	48 20.1	155.5	47 23.3	156.0	46 26.3	156.4	45 29.1	156.9	44 32.0	157.3	43 34.7	157.7	42 37.3	158.1
8	48 0.2	154.1	47 3.7	154.6	46 7.1	155.1	45 10.3	155.5	44 13.5	156.0	43 16.6	156.4	42 19.5	156.9
12	47 39.3	152.7	46 43.2	153.2	45 46.9	153.7	44 50.6	154.2	43 54.1	154.7	42 57.4	155.1	42 0.7	155.6
16	47 17.6	151.3	46 21.7	151.9	45 25.8	152.4	44 29.8	152.9	43 33.6	153.4	42 37.4	153.9	41 41.0	154.3
20	46 54.6	150.0	45 59.2	150.5	45 3.7	151.1	44 8.1	151.6	43 12.3	152.1	42 16.4	152.6	41 20.4	153.1
24	46 30.8	148.6	45 35.9	149.2	44 40.7	149.8	43 45.4	150.3	42 50.0	150.8	41 54.4	151.3	40 58.7	151.8
28	46 6.0	147.3	45 11.5	147.9	44 16.8	148.5	43 21.8	149.0	42 26.7	149.6	41 31.6	150.1	40 36.3	150.6
32	45 40.4	146.0	44 46.3	146.6	43 51.9	147.2	42 57.4	147.8	42 2.7	148.3	41 7.9	148.9	40 13.0	149.4
36	45 13.9	144.7	44 20.2	145.4	43 26.2	146.0	42 32.1	146.6	41 37.8	147.1	40 43.4	147.7	39 48.8	148.2
40	44 46.5	143.5	43 53.2	144.1	42 59.7	144.7	42 6.0	145.3	41 12.1	145.9	40 18.1	146.5	39 23.8	147.1
44	44 18.4	142.2	43 25.5	142.9	42 32.4	143.5	41 39.1	144.1	40 45.6	144.7	39 52.0	145.3	38 58.1	145.9
48	43 49.4	141.0	42 57.0	141.7	42 4.2	142.3	41 11.4	143.0	40 18.3	143.6	39 25.0	144.2	38 31.6	144.8
52	43 19.7	139.8	42 27.7	140.5	41 35.4	141.2	40 42.9	141.8	39 50.2	142.4	38 57.4	143.1	38 4.3	143.6
1 56	42 49.2	138.6	41 57.6	139.3	41 5.8	140.0	40 13.7	140.6	39 21.4	141.3	38 29.0	141.9	37 36.3	142.5
2 0	42 18.1	137.5	41 26.9	138.2	40 35.4	138.8	39 43.7	139.5	38 51.8	140.2	37 59.8	140.8	37 7.5	141.4
4	41 46.2	136.3	40 55.5	137.0	40 4.5	137.7	39 13.2	138.4	38 21.7	139.1	37 30.0	139.7	36 38.1	140.3
8	41 13.7	135.2	40 23.4	135.9	39 33.8	136.6	38 41.9	137.3	37 50.8	138.0	36 59.5	138.6	36 8.0	139.3
12	40 40.5	134.1	39 50.6	134.8	39 0.4	135.5	38 9.9	136.2	37 19.3	136.9	36 28.4	137.6	35 37.3	138.2
16	40 6.7	133.0	39 17.2	133.7	38 27.4	134.5	37 37.4	135.2	36 47.1	135.9	35 56.6	136.5	35 5.9	137.2
20	39 32.3	132.0	38 43.2	132.7	37 53.9	133.4	37 4.2	134.1	36 14.3	134.8	35 24.2	135.5	34 33.9	136.2
24	38 57.4	130.9	38 8.7	131.7	37 19.7	132.4	36 30.4	133.1	35 40.9	133.8	34 51.3	134.5	34 1.3	135.1
28	38 21.9	129.9	37 33.5	130.6	36 44.9	131.4	35 56.1	132.1	35 7.0	132.8	34 17.7	133.5	33 28.2	134.2
32	37 45.8	128.9	36 57.9	129.6	36 9.7	130.4	35 21.2	131.1	34 32.5	131.8	33 43.6	132.5	32 54.4	133.2
36	37 9.2	127.9	36 21.7	128.6	35 33.9	129.4	34 45.8	130.1	33 57.5	130.8	33 9.0	131.5	32 20.1	132.2
40	36 32.1	126.9	35 45.1	127.6	34 57.6	128.4	34 9.9	129.1	33 21.9	129.8	32 33.8	130.6	31 45.3	131.3
44	35 54.6	125.9	35 7.9	126.7	34 20.8	127.4	33 33.5	128.2	32 45.9	128.9	31 58.1	129.6	31 10.0	130.3
48	35 16.6	125.0	34 30.3	125.7	33 43.5	126.5	32 56.6	127.2	32 9.4	128.0	31 22.0	128.7	30 34.2	129.4
52	34 38.2	124.0	33 52.1	124.8	33 5.8	125.6	32 19.2	126.3	31 32.3	127.0	30 45.2	127.8	29 57.9	128.5
2 56	33 59.3	123.1	33 13.6	123.9	32 27.6	124.0	31 41.4	125.4	30 54.9	126.1	30 8.2	126.9	29 21.2	127.6
3 0	33 20.1	122.2	32 34.9	123.0	31 49.1	123.7	31 3.2	124.5	30 17.0	125.2	29 30.7	126.0	28 44.0	126.7
4	32 40.4	121.3	31 55.4	122.1	31 10.1	122.8	30 24.6	123.6	29 38.7	124.4	28 52.7	125.1	28 6.4	125.8
8	32 0.4	120.4	31 15.7	121.2	30 30.8	122.0	29 45.5	122.7	29 0.1	123.5	28 14.4	124.2	27 28.4	124.9
12	31 20.0	119.5	30 35.7	120.3	29 51.0	121.1	29 6.1	121.9	28 20.9	122.6	27 35.6	123.4	26 50.0	124.1
18	30 39.2	118.7	29 55.2	119.5	29 10.9	120.2	28 26.3	121.0	27 41.5	121.8	26 56.5	122.5	26 11.2	123.2
20	29 58.1	117.8	29 14.5	118.6	28 30.4	119.4	27 46.2	120.2	27 1.7	120.9	26 17.0	121.7	25 31.9	122.4
24	29 16.8	117.0	28 33.4	117.8	27 49.6	118.6	27 5.7	119.3	26 21.5	120.1	25 37.1	120.8	24 52.4	121.6
28	28 35.1	116.2	27 52.0	117.0	27 8.5	117.8	26 24.9	118.5	25 41.0	119.3	24 56.9	120.0	24 12.5	120.8
32	27 53.1	115.4	27 10.3	116.2	26 27.2	116.9	25 43.8	117.7	25 0.2	118.5	24 16.4	119.2	23 32.3	120.0
36	27 10.9	114.6	26 28.3	115.4	25 45.4	116.1	25 2.3	116.9	24 19.0	117.7	23 35.5	118.4	22 51.7	119.2
40	26 28.3	113.8	25 46.1	114.6	25 3.5	115.4	24 20.6	116.1	23 37.6	116.9	22 54.4	117.7	22 10.9	118.4
44	25 45.5	113.0	25 3.5	113.8	24 21.1	114.6	23 38.6	115.3	22 55.8	116.1	22 12.9	116.9	21 29.7	117.6
48	25 2.5	112.2	24 20.7	113.0	23 38.6	113.8	22 56.3	114.6	22 13.8	115.3	21 31.1	116.1	20 48.2	116.9
52	24 19.2	111.5	23 37.6	112.3	22 55.8	113.0	22 13.8	113.8	21 31.5	114.6	20 49.1	115.3	20 6.5	116.1
3 56	23 35.7	110.7	22 54.4	111.5	22 12.8	112.3	21 31.0	113.1	20 49.0	113.8	20 6.9	114.6	19 24.5	115.3
4 0	22 52.0	110.0	22 10.9	110.8	21 29.5	111.5	20 48.0	112.3	20 6.2	113.1	19 24.3	113.8	18 42.2	114.6
4	22 8.0	109.2	21 27.2	110.0	20 46.0	110.8	20 4.8	111.6	19 23.2	112.3	18 41.6	113.1	17 59.7	113.9
8	21 23.9	108.5	20 43.2	109.3	20 2.3	110.1	19 21.2	110.8	18 40.0	111.6	17 58.7	112.4	17 16.9	113.1
12	20 39.6	107.8	19 59.1	108.6	19 18.4	109.4	18 37.6	110.1	17 56.5	110.9	17 15.4	111.7	16 33.9	112.4
16	19 55.1	107.1	19 14.8	107.9	18 34.3	108.6	17 53.8	109.4	17 12.9	110.2	16 32.0	110.9	15 50.7	111.7
20	19 10.4	106.4	18 30.4	107.1	17 50.1	107.9	17 9.7	108.7	16 29.0	109.5	15 48.3	110.2	15 7.3	111.0
24	18 25.6	105.7	17 45.7	106.4	17 5.6	107.2	16 25.3	108.0	15 44.9	108.8	15 4.4	109.5	14 23.6	110.3
28	17 40.6	105.0	17 1.0	105.7	16 21.1	106.5	15 41.0	107.3	15 0.7	108.1	14 20.4	108.8	13 39.8	109.6
32	16 55.5	104.3	16 16.0	105.1	15 36.2	105.8	14 56.3	106.6	14 16.3	107.4	13 36.1	108.1	12 55.8	108.9
36	16 10.3	103.6	15 30.8	104.4	14 51.3	105.2	14 11.6	105.9	13 31.7	106.7	12 51.7	107.5	12 11.6	108.2
40	15 24.9	102.9	14 45.6	103.7	14 6.2	104.5	13 26.6	105.2	12 46.9	106.0	12 7.1	106.8	11 27.2	107.5
44	14 39.4	102.2	14 0.3	103.0	13 21.0	103.8	12 41.6	104.6	12 2.1	105.3	11 22.5	106.1	10 42.7	106.9
48	13 53.7	101.6	13 14.8	102.3	12 35.7	103.1	11 56.4	103.9	11 17.1	104.7	10 37.6	105.4	9 57.9	106.2
52	13 8.0	100.9	12 29.2	101.7	11 50.2	102.5	11 11.0	103.2	10 31.8	104.0	9 52.5	104.8	9 13.0	105.5
4 56	12 22.2	100.2	11 43.5	101.0	11 4.6	101.8	10 25.6	102.6	9 46.5	103.3	9 7.4	104.1	8 28.1	104.9
5 0	11 36.2	99.6	10 57.6	100.4	10 18.9	101.1	9 40.1	101.9	9 1.1	102.7	8 22.1	103.4	7 43.0	104.3
4	10 50.1	98.9	10 11.7	99.7	9 33.1	100.5	8 54.3	101.3	8 15.5	102.0	7 36.7	102.8	6 57.7	103.6
8	10 4.1	98.3	9 25.7	99.1	8 47.2	99.8	8 8.6	100.6	7 29.9	101.4	6 51.2	102.1	6 12.3	102.9
12	9 17.9	97.6	8 39.6	98.4	8 1.2	99.2	7 22.7	100.0	6 44.1	100.7	6 5.5	101.5	5 26.8	102.3
16	8 31.7	97.0	7 53.5	97.8	7 15.1	98.5	6 36.8	99.3	5 58.3	100.1	5 19.8	100.8	4 41.2	101.6
20	7 45.4	96.3	7 7.2	97.1	6 28.9	97.9	5 50.7	98.7	5 12.3	99.4	4 33.9	100.2	3 55.4	101.0
24	6 59.0	95.7	6 20.9	96.5	5 42.7	97.2	5 4.5	98.0	4 26.3	98.8	3 48.0	99.6	3 9.7	100.3
28	6 12.6	95.1	5 34.6	95.8	4 56.4	96.6	4 18.3	97.4	3 40.1	98.2	3 1.9	98.9	2 23.7	99.7
32	5 26.1	94.4	4 48.1	95.2	4 10.1	96.0	3 32.0	96.7	2 53.9	97.5	2 15.8	98.3	1 37.7	99.1
36	4 39.6	93.8	4 1.7	94.6	3 23.7	95.3	2 45.7	96.1	2 7.7	96.9	1 29.7	97.7	0 51.7	98.4
40	3 53.0	93.2	3 15.2	93.9	2 37.3	94.7	1 59.4	95.5	1 21.4	96.3	0 43.5	97.0	0 5.5	97.8
44	3 6.4	92.5	2 28.7	93.3	1 50.8	94.1	1 12.9	94.8	0 35.0	95.6				
48	2 19.8	91.9	1 42.1	92.7	1 4.3	93.5	0 26.4	94.2						
52	1 33.2	91.3	0 55.5	92.0	0 17.7	92.8								
5 56	0 46.6	90.6	0 8.9	91.4										
6 0	0 0.0	90.0												

5	56	12 34.5	75.6	13 10.7	74.8	13 46.7	74.0	14 22.7	73.1	14 58.4	72.3	15 34.0	71.5
6	0	11 49.4	75.0	12 25.8	74.2	13 2.1	73.4	13 38.2	72.6	14 14.1	71.8	14 49.8	70.9

SOUTH DECLINATION.

Hour Angle.	7°		8°		9°		10°		11°		12°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0 0	44 0.0	180.0	43 0.0	180.0	42 0.0	180.0	41 0.0	180.0	40 0.0	180.0	39 0.0	180.0
4	43 59.5	178.6	42 59.5	178.7	41 59.5	178.7	40 59.5	178.7	39 59.4	178.7	38 59.4	178.7
8	43 57.8	177.2	42 57.9	177.3	41 57.9	177.3	40 58.0	177.4	39 58.0	177.4	38 58.0	177.5
12	43 55.0	175.9	42 55.1	175.9	41 55.2	176.0	40 55.2	176.1	39 55.3	176.2	38 55.3	176.2
16	43 51.1	174.5	42 51.3	174.6	41 51.4	174.7	40 51.6	174.8	39 51.7	174.9	38 51.8	175.0
20	43 46.0	173.1	42 46.3	173.3	41 46.5	173.4	40 46.8	173.5	39 47.0	173.6	38 47.2	173.7
24	43 39.9	171.8	42 40.3	171.9	41 40.7	172.1	40 41.0	172.2	39 41.3	172.3	38 41.6	172.5
28	43 32.7	170.4	42 33.2	170.6	41 33.6	170.7	40 34.1	170.9	39 34.6	171.1	38 35.0	171.2
32	43 24.4	169.0	42 25.0	169.2	41 25.7	169.4	40 26.2	169.6	39 26.8	169.8	38 27.3	170.0
36	43 14.9	167.7	42 15.8	167.9	41 16.5	168.1	40 17.3	168.4	39 18.0	168.6	38 18.8	168.8
40	43 4.5	166.4	42 5.5	166.6	41 6.4	166.9	40 7.4	167.1	39 8.3	167.3	38 9.1	167.5
44	42 53.0	165.0	41 54.2	165.3	40 55.3	165.6	39 56.5	165.8	38 57.6	166.1	37 58.6	166.3
48	42 40.4	163.7	41 41.8	164.0	40 43.2	164.3	39 44.6	164.6	38 45.9	164.8	37 47.1	165.1
52	42 26.8	162.4	41 28.5	162.7	40 30.1	163.0	39 31.7	163.3	38 33.2	163.6	37 34.7	163.9
0 56	42 12.1	161.1	41 14.1	161.4	40 16.0	161.8	39 17.7	162.1	38 19.5	162.4	37 21.2	162.7
1 0	41 56.5	159.8	40 58.8	160.2	40 0.9	160.5	39 2.9	160.8	38 4.9	161.2	37 6.9	161.5
4	41 40.0	158.5	40 42.4	158.9	39 44.9	159.3	38 47.2	159.6	37 49.5	160.0	36 51.7	160.3
8	41 22.4	157.3	40 25.2	157.7	39 27.9	158.0	38 30.5	158.4	37 33.0	158.8	36 35.5	159.1
12	41 3.9	156.0	40 7.0	156.4	39 10.0	156.8	38 12.8	157.2	37 15.7	157.6	36 18.4	158.0
16	40 44.5	154.8	39 47.8	155.2	38 51.1	155.6	37 54.3	156.0	36 57.4	156.4	36 0.5	156.8
20	40 24.2	153.5	39 27.9	154.0	38 31.5	154.4	37 35.0	154.9	36 38.4	155.3	35 41.7	155.7
24	40 2.9	152.3	39 7.0	152.8	38 10.9	153.2	37 14.7	153.7	36 18.5	154.1	35 22.1	154.5
28	39 40.8	151.1	38 45.3	151.6	37 49.5	152.1	36 53.6	152.5	35 57.7	153.0	35 1.6	153.4
32	39 17.9	149.9	38 22.6	150.4	37 27.3	150.9	36 31.7	151.4	35 36.1	151.9	34 40.3	152.3
36	38 54.1	148.8	37 59.2	149.3	37 4.2	149.8	36 9.0	150.3	35 13.7	150.7	34 18.3	151.2
40	38 29.5	147.6	37 35.0	148.1	36 40.3	148.6	35 45.5	149.1	34 50.5	149.6	33 55.5	150.1
44	38 4.1	146.5	37 9.9	147.0	36 15.6	147.5	35 21.2	148.0	34 26.6	148.6	33 31.9	149.1
48	37 38.0	145.3	36 44.2	145.9	35 50.2	146.4	34 56.1	147.0	34 1.8	147.5	33 7.4	148.0
52	37 11.1	144.2	36 17.6	144.8	35 24.1	145.3	34 30.3	145.9	33 36.4	146.4	32 42.4	146.9
1 56	36 43.4	143.1	35 50.4	143.7	34 57.2	144.3	34 3.8	144.8	33 10.3	145.4	32 16.6	145.9
2 0	36 15.0	142.0	35 22.4	142.6	34 29.5	143.2	33 36.5	143.8	32 43.4	144.3	31 50.1	144.9
4	35 46.1	141.0	34 53.8	141.5	34 1.3	142.1	33 8.6	142.7	32 15.9	143.3	31 22.9	143.8
8	35 16.3	139.9	34 24.5	140.5	33 32.4	141.1	32 40.1	141.7	31 47.6	142.3	30 55.0	142.8
12	34 45.9	138.9	33 54.5	139.5	33 2.8	140.1	32 10.9	140.7	31 18.7	141.3	30 26.6	141.8
16	34 14.9	137.8	33 23.8	138.5	32 32.5	139.1	31 41.0	139.7	30 49.2	140.3	29 57.4	140.9
20	33 43.3	136.8	32 52.6	137.4	32 1.6	138.1	31 10.5	138.7	30 19.2	139.3	29 27.7	139.9
24	33 11.1	135.8	32 20.7	136.5	31 30.2	137.1	30 39.4	137.7	29 48.5	138.3	28 57.3	138.9
28	32 38.3	134.8	31 48.3	135.5	30 58.1	136.1	30 7.7	136.8	29 17.2	137.4	28 26.4	138.0
32	32 5.0	133.9	31 15.4	134.5	30 25.6	135.2	29 35.5	135.8	28 45.3	136.4	27 54.9	137.0
36	31 31.1	132.9	30 41.8	133.6	29 52.4	134.2	29 2.7	134.9	28 12.9	135.5	27 22.8	136.1
40	30 56.6	131.9	30 7.8	132.6	29 18.7	133.3	28 29.4	133.9	27 40.0	134.6	26 50.3	135.2
44	30 21.7	131.0	29 33.2	131.7	28 44.4	132.4	27 55.5	133.0	27 6.4	133.7	26 17.1	134.3
48	29 46.3	130.1	28 58.1	130.8	28 9.8	131.4	27 21.2	132.1	26 32.5	132.8	25 43.5	133.4
52	29 10.3	129.2	28 22.6	129.9	27 34.6	130.5	26 46.4	131.2	25 58.0	131.9	25 9.4	132.5
2 56	28 34.0	128.3	27 46.6	129.0	26 58.9	129.7	26 11.1	130.3	25 23.0	131.0	24 34.8	131.7
3 0	27 57.1	127.4	27 10.1	128.1	26 22.8	128.8	25 35.3	129.5	24 47.6	130.1	23 59.8	130.8
4	27 19.9	126.5	26 33.2	127.2	25 46.2	127.9	24 59.1	128.6	24 11.8	129.3	23 24.2	130.0
8	26 42.2	125.7	25 55.8	126.4	25 9.2	127.1	24 22.4	127.8	23 35.4	128.4	22 48.3	129.1
12	26 4.1	124.8	25 18.1	125.5	24 31.8	126.2	23 45.4	126.9	22 58.7	127.6	22 11.9	128.3
16	25 25.6	124.0	24 39.9	124.7	23 54.0	125.4	23 7.9	126.1	22 21.6	126.8	21 35.0	127.5
20	24 46.8	123.1	24 1.4	123.8	23 15.8	124.6	22 30.0	125.3	21 44.0	126.0	20 57.8	126.6
24	24 7.5	122.3	23 22.5	123.0	22 37.2	123.7	21 51.7	124.5	21 6.0	125.2	20 20.2	125.8
28	23 27.9	121.5	22 43.2	122.2	21 58.2	122.9	21 13.0	123.7	20 27.7	124.4	19 42.2	125.0
32	22 48.1	120.7	22 3.6	121.4	21 19.0	122.1	20 34.1	122.9	19 49.1	123.6	19 3.8	124.3
36	22 7.8	119.9	21 23.6	120.6	20 39.3	121.4	19 54.7	122.1	19 10.1	122.8	18 25.1	123.5
40	21 27.2	119.1	20 43.4	119.9	19 59.3	120.6	19 15.1	121.3	18 30.6	122.0	17 46.1	122.7
44	20 46.3	118.4	20 2.7	119.1	19 19.0	119.8	18 35.1	120.5	17 50.9	121.3	17 6.7	122.0
48	20 5.1	117.6	19 21.8	118.3	18 38.4	119.1	17 54.7	119.8	17 10.9	120.5	16 26.9	121.2
52	19 23.7	116.8	18 40.7	117.6	17 57.5	118.3	17 14.1	119.0	16 30.5	119.7	15 46.9	120.5
3 56	18 41.9	116.1	17 59.2	116.8	17 16.3	117.6	16 33.2	118.3	15 49.9	119.0	15 6.6	119.7
4 0	18 0.0	115.3	17 17.4	116.1	16 34.8	116.8	15 52.0	117.6	15 9.0	118.3	14 25.9	119.0
4	17 17.7	114.6	16 35.4	115.4	15 53.0	116.1	15 10.5	116.8	14 27.8	117.6	13 45.0	118.3
8	16 35.1	113.9	15 53.1	114.6	15 11.0	115.4	14 28.7	116.1	13 46.3	116.8	13 3.8	117.6
12	15 52.4	113.2	15 10.7	113.9	14 28.9	114.7	13 46.8	115.4	13 4.7	116.1	12 22.3	116.9
16	15 9.4	112.4	14 27.9	113.2	13 46.3	113.9	13 4.5	114.7	12 22.6	115.4	11 40.6	116.2
20	14 26.2	111.7	13 45.0	112.5	13 3.6	113.2	12 22.0	114.0	11 40.4	114.7	10 58.6	115.5
24	13 42.8	111.0	13 1.8	111.8	12 20.6	112.5	11 39.4	113.3	10 57.9	114.0	10 16.4	114.8
28	12 59.2	110.3	12 18.4	111.1	11 37.4	111.9	10 56.3	112.6	10 15.2	113.3	9 33.9	114.1
32	12 15.3	109.7	11 34.8	110.4	10 54.1	111.2	10 13.2	111.9	9 32.2	112.7	8 51.2	113.4
36	11 31.3	109.0	10 51.0	109.7	10 10.5	110.5	9 29.8	111.2	8 49.1	112.0	8 8.3	112.7
40	10 47.1	108.3	10 6.9	109.1	9 26.7	109.8	8 46.2	110.6	8 5.8	111.3	7 25.2	112.1
44	10 2.7	107.6	9 22.8	108.4	8 42.7	109.1	8 2.5	109.9	7 22.2	110.6	6 41.9	111.4
48	9 18.2	107.0	8 38.4	107.7	7 58.6	108.5	7 18.5	109.2	6 38.5	110.0	5 58.4	110.7
52	8 33.6	106.3	7 53.9	107.1	7 14.2	107.8	6 34.4	108.6	5 54.6	109.3	5 14.6	110.1
4 56	7 48.8	105.6	7 9.3	106.4	6 29.8	107.1	5 50.2	107.9	5 10.5	108.7	4 30.7	109.4
5 0	7 3.8	105.0	6 24.5	105.7	5 45.2	106.5	5 5.7	107.3	4 26.3	108.0	3 46.7	108.8
4	6 18.7	104.3	5 39.6	105.1	5 0.3	105.8	4 21.1	106.6	3 41.8	107.4	3 2.4	108.1
8	5 33.4	103.7	4 54.4	104.4	4 15.4	105.2	3 36.3	106.0	2 57.2	106.7	2 18.1	107.5
12	4 48.0	103.0	4 9.2	103.8	3 30.3	104.6	2 51.4	105.3	2 12.5	106.1	1 33.5	106.8
16	4 2.6	102.4	3 23.9	103.2	2 45.2	103.9	2 6.4	104.7	1 27.6	105.4	0 48.8	106.2
20	3 16.8	101.7	2 38.4	102.5	1 59.8	103.3	1 21.2	104.1	0 42.6	104.8	0 4.0	105.6
24	2 31.1	101.1	1 52.9	101.9	1 14.4	102.7	0 36.0	103.4				
28	1 45.5	100.5	1 7.2	101.3	0 28.9	102.0						
32	0 59.6	99.8	0 21.4	100.6								
36	0 13.6	99.2										
40												
44												
48												
52												
5 56												
6 0												

6	0	0	0.0	90.0																			

SOUTH DECLINATION.

Hour Angle.	13°		14°		15°		16°		17°		18°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0 0	38 0.0	180.0	37 0.0	180.0	36 0.0	180.0	35 0.0	180.0	34 0.0	180.0	33 0.0	180.0
4	37 59.4	178.8	36 59.5	178.8	35 59.5	178.8	34 59.5	178.8	33 59.5	178.8	32 59.6	178.9
8	37 58.0	177.5	36 58.1	177.6	35 58.1	177.6	34 58.1	177.7	33 58.2	177.7	32 58.2	177.7
12	37 55.4	176.3	36 55.5	176.4	35 55.6	176.4	34 55.7	176.5	33 55.8	176.5	32 55.9	176.6
16	37 51.9	175.1	36 52.1	175.1	35 52.2	175.2	34 52.3	175.3	33 59.5	175.4	32 52.7	175.5
20	37 47.4	173.8	36 47.6	173.9	35 47.8	174.0	34 48.0	174.1	33 48.2	174.2	32 48.5	174.3
24	37 41.9	172.6	36 42.3	172.7	35 42.6	172.9	34 42.9	173.0	33 43.2	173.1	32 43.5	173.2
28	37 35.5	171.4	36 35.9	171.5	35 36.2	171.7	34 36.6	171.8	33 37.0	172.0	32 37.5	172.1
32	37 27.9	170.2	36 28.5	170.3	35 29.0	170.5	34 29.5	170.7	33 30.1	170.8	32 30.6	171.0
36	37 19.5	169.0	36 20.2	169.1	35 20.9	169.3	34 21.5	169.5	33 22.2	169.7	32 22.8	169.9
40	37 10.0	167.8	36 10.9	168.0	35 11.7	168.2	34 12.5	168.4	33 13.4	168.6	32 14.2	168.7
44	36 59.7	166.6	36 0.7	166.8	35 1.7	167.0	34 2.7	167.2	33 3.6	167.4	32 4.6	167.6
48	36 48.3	165.4	35 49.6	165.6	34 50.8	165.8	33 51.9	166.1	32 53.1	166.3	31 54.2	166.5
52	36 36.1	164.2	35 37.5	164.4	34 38.9	164.7	33 40.3	164.9	32 41.6	165.2	31 42.9	165.4
0 56	36 22.8	163.0	35 24.5	163.3	34 26.1	163.5	33 27.7	163.8	32 29.2	164.1	31 30.7	164.3
1 0	36 8.8	161.8	35 10.6	162.1	34 12.4	162.4	33 14.2	162.7	32 16.0	163.0	31 17.7	163.3
4	35 53.9	160.6	34 55.9	161.0	33 57.9	161.3	32 59.9	161.6	32 1.9	161.9	31 3.9	162.2
8	35 37.9	159.5	34 40.3	159.8	33 42.6	160.2	32 44.8	160.5	31 47.0	160.8	30 49.2	161.1
12	35 21.1	158.3	34 23.8	158.7	33 26.3	159.0	32 28.8	159.4	31 31.3	159.7	30 33.7	160.1
16	35 3.5	157.2	34 6.4	157.6	33 9.2	157.9	32 12.0	158.3	31 14.8	158.6	30 17.4	159.0
20	34 45.0	156.1	33 48.1	156.5	32 51.3	156.8	31 54.3	157.2	30 57.4	157.6	30 0.3	157.9
24	34 25.7	155.0	33 29.1	155.4	32 32.5	155.8	31 35.9	156.1	30 39.2	156.5	29 42.4	156.9
28	34 5.8	153.9	33 9.5	154.3	32 13.1	154.7	31 16.6	155.1	30 20.2	155.5	29 23.7	155.9
32	33 44.5	152.8	32 48.6	153.2	31 52.7	153.6	30 56.6	154.0	30 0.5	154.4	29 4.3	154.8
36	33 22.8	151.7	32 27.2	152.1	31 31.6	152.6	30 35.8	153.0	29 40.0	153.4	28 44.0	153.8
40	33 0.3	150.6	32 5.1	151.1	31 9.7	151.5	30 14.2	152.0	29 18.7	152.4	28 23.1	152.8
44	32 37.1	149.5	31 42.2	150.0	30 47.1	150.5	29 52.0	150.9	28 56.8	151.4	28 1.5	151.8
48	32 13.0	148.5	31 18.4	149.0	30 23.7	149.4	29 28.9	149.9	28 34.0	150.4	27 39.0	150.8
52	31 48.3	147.4	30 54.1	147.9	29 59.7	148.4	29 5.2	148.9	28 10.6	149.4	27 16.0	149.9
1 56	31 22.8	146.4	30 28.9	146.9	29 34.9	147.4	28 40.8	147.9	27 46.5	148.4	26 52.1	148.9
2 0	30 56.7	145.4	30 3.1	145.9	29 9.5	146.4	28 15.7	146.9	27 21.9	147.4	26 27.9	147.9
4	30 29.9	144.4	29 36.7	144.9	28 43.3	145.4	27 49.9	146.0	26 56.4	146.5	26 2.7	147.0
8	30 2.4	143.4	29 9.5	143.9	28 16.6	144.5	27 23.5	145.0	26 30.3	145.5	25 37.0	146.0
12	29 34.2	142.4	28 41.7	143.0	27 49.1	143.5	26 56.4	144.0	26 3.6	144.6	25 10.6	145.1
16	29 5.5	141.4	28 13.3	142.0	27 21.1	142.6	26 28.7	143.1	25 36.2	143.6	24 43.6	144.2
20	28 36.1	140.5	27 44.3	141.1	26 52.4	141.6	26 0.4	142.2	25 8.2	142.7	24 16.0	143.3
24	28 6.1	139.5	27 14.7	140.1	26 23.1	140.7	25 31.5	141.2	24 39.7	141.8	23 47.8	142.4
28	27 35.5	138.6	26 44.5	139.2	25°53.3	139.8	25 2.0	140.3	24 10.6	140.9	23 19.1	141.5
32	27 4.4	137.7	26 13.7	138.3	25 22.8	138.8	24 31.9	139.4	23 40.9	140.0	22 49.7	140.6
36	26 32.7	136.7	25 42.4	137.3	24 52.0	137.9	24 1.4	138.5	23 10.7	139.1	22 19.8	139.7
40	26 0.5	135.8	25 10.5	136.4	24 20.4	137.0	23 30.2	137.6	22 39.8	138.2	21 49.3	138.8
44	25 27.7	134.9	24 38.1	135.6	23 48.3	136.2	22 58.5	136.8	22 8.5	137.4	21 18.4	138.0
48	24 54.5	134.1	24 5.2	134.7	23 15.8	135.3	22 26.3	135.9	21 36.7	136.5	20 46.9	137.1
52	24 20.7	133.2	23 31.8	133.8	22 42.7	134.4	21 53.6	135.1	21 4.3	135.7	20 14.9	136.3
2 56	23 46.5	132.3	22 57.9	132.9	22 9.2	133.6	21 20.4	134.2	20 31.5	134.8	19 42.4	135.4
3 0	23 11.7	131.5	22 23.5	132.1	21 35.2	132.7	20 46.8	133.4	19 58.2	134.0	19 9.5	134.6
4	22 36.5	130.6	21 48.7	131.3	21 0.7	131.9	20 12.6	132.5	19 24.4	133.2	18 36.0	133.8
8	22 0.9	129.8	21 13.4	130.4	20 25.9	131.1	19 38.1	131.7	18 50.2	132.4	18 2.1	133.0
12	21 24.9	128.9	20 37.7	129.6	19 50.4	130.3	19 3.0	130.9	18 15.5	131.6	17 27.8	132.2
16	20 48.4	128.1	20 1.6	128.8	19 14.7	129.5	18 27.6	130.1	17 40.4	130.8	16 53.0	131.4
20	20 11.6	127.3	19 25.1	128.0	18 38.5	128.7	17 51.7	129.3	17 4.9	130.0	16 17.9	130.6
24	19 34.2	126.5	18 48.1	127.2	18 1.8	127.9	17 15.4	128.5	16 28.9	129.2	15 42.2	129.8
28	18 56.6	125.7	18 10.8	126.4	17 24.8	127.1	16 38.8	127.8	15 52.6	128.4	15 6.2	129.1
32	18 18.5	124.9	17 33.1	125.6	16 47.5	126.3	16 1.7	127.0	15 15.9	127.7	14 29.9	128.3
36	17 40.1	124.2	16 55.0	124.9	16 9.7	125.6	15 24.3	126.2	14 38.7	126.9	13 53.0	127.6
40	17 1.4	123.4	16 16.6	124.1	15 31.6	124.8	14 46.5	125.5	14 1.3	126.2	13 15.9	126.8
44	16 22.3	122.7	15 37.8	123.4	14 53.1	124.1	14 8.3	124.7	13 23.4	125.4	12 38.4	126.1
48	15 42.9	121.9	14 58.7	122.6	14 14.4	123.3	13 29.9	124.0	12 45.3	124.7	11 0.6	125.4
52	15 3.1	121.2	14 19.2	121.9	13 35.1	122.6	12 51.0	123.3	12 6.8	124.0	11 22.4	124.7
3 56	14 23.1	120.4	13 39.5	121.1	12 55.7	121.8	12 11.9	122.5	11 28.0	123.2	10 43.9	123.9
4 0	13 42.8	119.7	12 59.4	120.4	12 15.9	121.1	11 32.3	121.8	10 48.7	122.5	10 5.0	123.2
4	13 2.1	119.0	12 19.0	119.7	11 35.9	120.4	10 52.6	121.1	10 9.3	121.8	9 25.9	122.5
8	12 21.2	118.3	11 38.4	119.0	10 55.5	119.7	10 12.6	120.4	9 29.6	121.1	8 46.4	121.8
12	11 39.9	117.6	10 57.4	118.3	10 14.9	119.0	9 32.2	119.7	8 49.5	120.4	8 6.6	121.1
16	10 58.5	116.9	10 16.3	117.6	9 34.0	118.3	8 51.6	119.0	8 9.1	119.8	7 26.6	120.5
20	10 16.6	116.2	9 34.8	116.9	8 52.8	117.6	8 10.7	118.4	7 28.5	119.1	6 46.3	119.8
24	9 34.8	115.5	8 53.1	116.2	8 11.4	116.9	7 29.5	117.7	6 47.7	118.4	6 5.6	119.1
28	8 52.6	114.8	8 11.1	115.5	7 29.6	116.3	6 48.1	117.0	6 6.4	117.7	5 24.8	118.4
32	8 10.2	114.1	7 29.0	114.9	6 47.7	115.6	6 6.4	116.3	5 25.0	117.1	4 43.6	117.8
36	7 27.5	113.5	6 46.5	114.2	6 5.6	114.9	5 24.5	115.7	4 43.4	116.4	4 2.3	117.1
40	6 44.6	112.8	6 3.9	113.5	5 23.1	114.3	4 42.3	115.0	4 1.5	115.7	3 20.6	116.5
44	6 1.3	112.1	5 21.0	112.9	4 40.5	113.6	4 0.0	114.4	3 19.4	115.1	2 38.8	115.8
48	5 18.2	111.5	4 37.9	112.2	3 57.6	113.0	3 17.3	113.7	2 37.0	114.4	1 56.7	115.2
52	4 34.7	110.8	3 54.7	111.6	3 14.6	112.3	2 34.5	113.1	1 54.4	113.8	1 14.3	114.5
4 56	3 51.0	110.2	3 11.2	110.9	2 31.4	111.7	1 51.5	112.4	1 11.7	113.2	0 31.9	113.9
5 0	3 7.2	109.5	2 27.6	110.3	1 48.0	111.0	1 8.4	111.8	0 28.8	112.5		
4	2 23.1	108.9	1 43.7	109.6	1 4.4	110.4	0 25.0	111.1				
8	1 38.9	108.2	0 59.8	109.0	0 20.5	109.8						
12	0 54.6	107.6	0 15.6	108.4								
16	0 10.0	107.0										
20												
24												
28												
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48												
52												
5 56												
6 0												

5	56																						
6	0																						

SOUTH DECLINATION

Hour Angle.	19°		20°		21°		22°		23°		24°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0 0	32 0.0	180.0	31 0.0	180.0	30 0.0	180.0	29 0.0	180.0	28 0.0	180.0	27 0.0	180.0
4	31 59.6	178.9	30 59.6	178.9	29 59.6	178.9	28 59.6	178.9	27 59.6	179.0	26 59.6	178.9
8	31 58.3	177.8	30 58.3	177.8	29 58.3	177.8	28 58.3	177.9	27 58.3	177.9	26 58.3	177.9
12	31 56.0	176.7	30 56.1	176.7	29 56.1	176.8	28 56.2	176.8	27 56.2	176.9	26 56.3	176.9
16	31 52.8	175.5	30 53.0	175.6	29 53.1	175.7	28 53.2	175.8	27 53.2	175.8	26 53.3	175.9
20	31 48.7	174.4	30 48.9	174.5	29 49.1	174.6	28 49.3	174.7	27 49.4	174.8	26 49.6	174.9
24	31 43.7	173.3	30 44.0	173.4	29 44.3	173.6	28 44.6	173.7	27 44.8	173.8	26 45.1	173.8
28	31 37.8	172.2	30 38.2	172.4	29 38.6	172.5	28 39.0	172.6	27 39.3	172.7	26 39.7	172.8
32	31 31.1	171.1	30 31.6	171.3	29 32.1	171.4	28 32.6	171.6	27 33.0	171.7	26 33.4	171.8
36	31 23.5	170.0	30 24.1	170.2	29 24.7	170.4	28 25.3	170.5	27 25.8	170.7	26 26.4	170.8
40	31 14.9	168.9	30 15.7	169.1	29 16.5	169.3	28 17.2	169.5	27 17.9	169.6	26 18.6	169.8
44	31 5.5	167.8	30 6.4	168.0	29 7.3	168.2	28 8.1	168.4	27 9.0	168.6	26 9.8	168.8
48	30 55.3	166.8	29 56.4	167.0	28 57.4	167.2	27 58.5	167.4	26 59.5	167.6	26 0.5	167.8
52	30 44.2	165.7	29 45.4	165.9	28 46.7	166.1	27 47.8	166.4	26 49.0	166.6	25 50.1	166.8
0 56	30 32.2	164.6	29 33.7	164.8	28 35.1	165.1	27 36.5	165.3	26 37.8	165.6	25 39.2	165.8
1 0	30 19.4	163.5	29 21.1	163.8	28 22.7	164.1	27 24.2	164.3	26 25.8	164.6	25 27.3	164.8
4	30 5.8	162.5	29 7.7	162.8	28 9.5	163.0	27 11.2	163.3	26 13.0	163.6	25 14.7	163.8
8	29 51.4	161.4	28 53.5	161.7	27 55.5	162.0	26 57.5	162.3	25 59.5	162.6	25 1.4	162.9
12	29 36.1	160.4	28 38.4	160.7	27 40.7	161.0	26 42.9	161.3	25 45.1	161.6	24 47.2	161.9
16	29 20.1	159.3	28 22.6	159.7	27 25.1	160.0	26 27.5	160.3	25 29.9	160.6	24 32.3	160.9
20	29 3.1	158.3	28 5.9	158.6	27 8.7	159.0	26 11.4	159.3	25 14.1	159.6	24 16.7	160.0
24	28 45.6	157.3	27 48.7	157.6	26 51.7	158.0	25 54.6	158.3	24 57.5	158.7	24 0.4	159.0
28	28 27.1	156.3	27 30.5	156.6	26 33.8	157.0	25 37.0	157.4	24 40.1	157.7	23 43.3	158.1
32	28 8.0	155.2	27 11.6	155.6	26 15.2	156.0	25 18.7	156.4	24 22.1	156.8	23 25.5	157.1
36	27 48.0	154.2	26 52.0	154.6	25 55.9	155.0	24 59.6	155.4	24 3.4	155.8	23 7.0	156.2
40	27 27.5	153.2	26 31.7	153.7	25 35.8	154.1	24 39.9	154.5	23 43.9	154.9	22 47.9	155.2
44	27 6.1	152.3	26 10.6	152.7	25 15.1	153.1	24 19.4	153.5	23 23.7	153.9	22 27.9	154.3
48	26 44.0	151.3	25 48.8	151.7	24 53.6	152.2	23 58.3	152.6	23 3.0	153.0	22 7.5	153.4
52	26 21.3	150.3	25 26.4	150.8	24 31.5	151.2	23 36.5	151.7	22 41.5	152.1	21 46.3	152.5
1 56	25 57.8	149.3	25 3.3	149.8	24 8.7	150.3	23 14.0	150.7	22 19.2	151.2	21 24.4	151.6
2 0	25 33.7	148.4	24 39.5	148.9	23 45.3	149.4	22 50.9	149.8	21 56.4	150.3	21 1.9	150.7
4	25 9.0	147.5	24 15.1	147.9	23 21.2	148.4	22 27.1	148.9	21 33.0	149.4	20 38.8	149.8
8	24 43.6	146.5	23 50.1	147.0	22 56.5	147.5	22 2.7	148.0	21 8.9	148.5	20 15.0	148.9
12	24 17.5	145.6	23 24.3	146.1	22 31.0	146.6	21 37.7	147.1	20 44.2	147.6	19 50.6	148.1
16	23 50.9	144.7	22 58.1	145.2	22 5.1	145.7	21 12.1	146.2	20 18.9	146.7	19 25.7	147.2
20	23 23.6	143.8	22 31.1	144.3	21 38.5	144.8	20 45.8	145.3	19 53.0	145.9	19 0.1	146.4
24	22 55.8	143.0	22 3.6	143.4	21 11.4	144.0	20 19.0	144.5	19 26.6	145.0	18 34.0	145.5
28	22 27.4	142.0	21 35.5	142.6	20 43.6	143.1	19 51.6	143.6	18 59.5	144.1	18 7.3	144.7
32	21 58.4	141.1	21 6.9	141.7	20 15.3	142.2	19 23.7	142.8	18 32.0	143.3	17 40.1	143.8
36	21 28.8	140.3	20 37.7	140.8	19 46.5	141.4	18 55.1	141.9	18 3.8	142.5	17 12.2	143.0
40	20 58.6	139.4	20 7.9	140.0	19 17.1	140.5	18 26.2	141.1	17 35.1	141.6	16 44.0	142.2
44	20 28.1	138.6	19 37.7	139.1	18 47.2	139.7	17 56.6	140.3	17 5.9	140.8	16 15.1	141.4
48	19 57.0	137.7	19 7.0	138.3	18 16.9	138.9	17 26.6	139.5	16 36.2	140.0	15 45.7	140.6
52	19 25.3	136.9	18 35.6	137.5	17 45.9	138.1	16 56.0	138.6	16 6.0	139.2	15 15.9	139.8
2 56	18 53.2	136.0	18 3.9	136.7	17 14.4	137.2	16 24.9	137.8	15 35.2	138.4	14 45.5	139.0
3 0	18 20.6	135.2	17 31.6	135.8	16 42.6	136.4	15 53.3	137.0	15 4.0	137.6	14 14.6	138.2
4	17 47.5	134.4	16 58.9	135.0	16 10.2	135.6	15 21.3	136.2	14 32.4	136.8	13 43.3	137.4
8	17 13.9	133.6	16 25.6	134.2	15 37.3	134.9	14 48.8	135.5	14 0.3	136.1	13 11.6	136.7
12	16 40.0	132.8	15 52.1	133.5	15 4.1	134.1	14 15.9	134.7	13 27.7	135.3	12 39.3	135.9
16	16 5.6	132.0	15 18.0	132.7	14 30.3	133.3	13 42.5	133.9	12 54.6	134.6	12 6.7	135.2
20	15 30.7	131.3	14 43.5	131.9	13 56.2	132.5	13 8.7	133.2	12 21.2	133.8	11 33.6	134.4
24	14 55.5	130.5	14 8.6	131.1	13 21.6	131.8	12 34.5	132.4	11 47.3	133.1	11 0.0	133.7
28	14 19.8	129.7	13 33.3	130.4	12 46.7	131.0	11 59.9	131.7	11 13.0	132.3	10 26.1	133.0
32	13 43.8	129.0	12 57.6	129.6	12 11.3	130.3	11 24.9	130.9	10 38.4	131.6	9 51.8	132.2
36	13 7.3	128.2	12 21.4	128.9	11 35.5	129.6	10 49.4	130.2	10 3.3	130.9	9 17.0	131.5
40	12 30.6	127.5	11 45.0	128.2	10 59.4	128.8	10 13.6	129.5	9 27.8	130.2	8 41.9	130.8
44	11 53.3	126.8	11 8.2	127.5	10 22.9	128.1	9 37.5	128.8	8 52.0	129.4	8 6.5	130.1
48	11 15.8	126.1	10 31.0	126.7	9 46.0	127.4	9 0.9	128.1	8 15.8	128.7	7 30.6	129.4
52	10 37.9	125.3	9 53.4	126.0	9 8.8	126.7	8 24.0	127.4	7 39.2	128.0	6 54.4	128.7
3 56	9 59.7	124.6	9 15.5	125.3	8 31.2	126.0	7 46.8	126.7	7 2.3	127.4	6 17.8	128.0
4 0	9 21.2	123.9	8 37.3	124.6	7 53.3	125.1	7 9.2	126.0	6 25.1	126.7	5 40.9	127.3
4	8 42.4	123.2	7 58.8	123.9	7 15.1	124.6	6 31.4	125.3	5 47.6	126.0	5 3.7	126.7
8	8 3.2	122.5	7 19.9	123.2	6 36.5	123.9	5 53.1	124.6	5 9.6	125.3	4 26.1	126.0
12	7 23.7	121.8	6 40.7	122.6	5 57.7	123.3	5 14.6	124.0	4 31.4	124.6	3 48.2	125.3
16	6 43.9	121.2	6 1.3	121.9	5 18.6	122.6	4 35.7	123.3	3 53.0	124.0	3 10.1	124.7
20	6 3.9	120.5	5 21.6	121.2	4 39.1	121.9	3 56.6	122.6	3 14.1	123.3	2 31.5	124.0
24	5 23.6	119.8	4 41.5	120.5	3 59.4	121.3	3 17.2	122.0	2 35.0	122.7	1 52.8	123.4
28	4 43.0	119.2	4 1.2	119.9	3 19.4	120.6	2 37.5	121.3	1 55.6	122.0	1 13.7	122.8
32	4 2.1	118.5	3 20.6	119.2	2 39.1	120.0	1 57.5	120.7	1 15.9	121.4	0 34.3	122.1
36	3 21.0	117.9	2 39.8	118.6	1 58.6	119.3	1 17.3	120.0	0 36.0	120.8		
40	2 39.7	117.2	1 58.7	117.9	1 17.8	118.7	0 36.8	119.4				
44	1 58.1	116.6	1 17.5	117.3	0 36.8	118.0						
48	1 16.3	115.9	0 35.9	116.7								
52	0 34.2	115.3										
4 56												
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5 56												
6 0												

Hour Angle	α Tauri Aldebaran		β Orionis Rigel		α Aurigæ Capella		α Orionis Betelgeux		α Can. Maj. Sirius		α Can. Min. Procyon		β Gemin. Pollux		α Leonis Regulus		α Virginis Spica	
	Dec. +16° 20′.8		Dec. −8° 17′.7		Dec. +45° 55′.0		Dec. +7° 23′.6		Dec. −16° 36′.3		Dec. +5° 26′.0		Dec. +28° 13′.4		Dec. +12° 21.9		Dec. −10°	
	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.
h. m.	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°
0 0	67 20.8	180.0	42 42.3	180.0	83 5.0	0.0	58 23.6	180.0	34 23.7	180.0	56 26.0	180.0	79 13.4	180.0	64 [illegible]	180.0	40 15.7	180.0
4	67 10.7	177.5	42 41.8	178.7	83 2.6	5.8	58 22.9	178.1	34 23.2	178.8	56 25.4	178.2	79 11.3	175.2	64 [illegible]	177.8	40 15.2	179.4
8	67 16.8	175.0	42 40.2	177.3	82 55.7	11.4	58 20.7	176.2	34 21.9	177.7	56 23.2	176.4	79 5.7	170.6	64 [illegible]	173.6	40 13.7	178.7
12	67 11.7	172.5	42 37.4	176.0	82 44.2	16.8	58 16.8	174.3	34 19.5	176.5	56 19.6	174.6	78 56.4	166.1	64 [illegible]	169.4	40 11.0	178.1
16	67 4.7	170.1	42 33.6	174.6	82 28.8	21.8	58 11.5	172.5	34 16.1	175.4	56 14.4	172.8	78 43.4	161.7	64 [illegible]	165.1	40 7.4	177.5
20	66 55.6	167.7	42 28.6	173.3	82 9.8	36.4	58 4.6	170.6	34 11.8	174.2	56 7.8	171.0	78 27.2	157.4	64 [illegible]	160.2	40 2.6	176.9
24	66 44.5	165.3	42 22.7	172.0	81 47.6	30.6	57 56.2	168.7	34 6.8	173.1	56 0.9	169.3	78 7.7	153.4	64 [illegible]	156.1	39 56.9	176.3
28	66 31.9	162.9	42 15.6	170.6	81 22.4	34.4	57 46.3	167.9	34 0.5	171.9	55 50.5	167.5	77 45.3	149.6	64 [illegible]	152.0	39 50.2	175.7
32	66 17.3	160.6	42 7.5	169.3	80 54.9	37.8	57 35.0	165.1	33 53.6	170.8	55 39.8	165.8	77 20.5	146.0	64 [illegible]	148.0	39 42.3	175.1
36	66 1.0	158.3	41 58.3	168.0	80 25.3	40.9	57 22.4	163.3	33 45.6	169.6	55 27.6	164.1	76 53.3	142.6	64 [illegible]	144.1	39 33.5	174.5
40	65 42.9	156.1	41 48.1	166.7	79 53.9	43.6	57 8.3	161.5	33 36.7	168.5	55 14.1	162.4	76 24.0	139.4	64 [illegible]	140.3	39 23.7	173.8
44	65 23.2	153.9	41 36.8	165.4	79 21.0	45.9	56 52.8	159.7	33 26.9	167.4	54 59.2	160.7	75 52.8	136.4	64 [illegible]	136.9	39 13.0	173.2
48	65 1.9	151.8	41 24.5	164.1	78 46.9	48.0	56 35.9	158.0	33 16.3	166.2	54 43.2	159.0	75 19.7	133.7	64 [illegible]	133.0	39 1.2	172.6
52	64 39.2	149.7	41 11.3	162.8	78 11.7	49.9	56 17.8	156.3	33 4.6	165.1	54 25.8	157.4	74 45.3	131.1	64 [illegible]	129.3	38 48.5	172.0
0 56	64 14.9	147.7	40 57.0	161.5	77 35.8	51.6	55 58.4	154.6	32 52.3	164.0	54 7.3	155.7	74 9.5	128.7	64 [illegible]	125.2	38 34.7	171.4
1 0	63 49.3	145.7	40 41.7	160.3	76 58.9	53.1	55 37.9	153.0	32 39.0	162.9	53 47.6	154.1	73 32.5	126.4	64 [illegible]	149.4	38 20.1	170.8
4	63 22.4	143.8	40 25.4	159.0	76 21.2	54.4	55 16.0	151.3	32 24.8	161.8	53 26.7	152.6	72 54.3	124.3	64 [illegible]	147.6	38 4.6	170.2
8	62 54.3	142.0	40 8.3	157.8	75 43.0	55.5	54 53.1	149.7	32 9.8	160.7	53 4.6	151.0	72 15.2	122.3	64 [illegible]	145.9	37 48.1	169.7
12	62 24.9	140.2	39 50.2	156.5	75 4.3	56.6	54 29.0	148.2	31 54.0	159.6	52 41.5	149.5	71 35.5	120.4	64 [illegible]	144.3	37 31.6	169.2
16	61 54.5	138.4	39 31.1	155.3	74 25.3	57.5	54 3.9	146.6	31 37.4	158.5	52 17.2	148.0	70 55.0	118.7	64 [illegible]	140.5	37 15.3	168.8
20	61 23.1	136.7	39 11.3	154.1	73 45.6	58.3	53 37.8	145.1	31 19.9	157.4	51 52.0	146.5	70 13.7	115.0	64 [illegible]	140.9	36 53.2	168.4
24	60 50.6	135.1	38 50.5	152.9	73 5.7	59.0	53 10.6	143.6	31 1.6	156.4	51 25.9	145.1	69 31.8	111.5	64 [illegible]	139.3	36 33.2	168.0
28	60 17.3	133.5	38 28.8	151.7	72 25.8	59.7	52 42.5	142.2	30 42.5	155.3	50 58.1	143.7	68 49.6	114.0	64 [illegible]	137.8	36 12.4	167.6
32	59 43.0	132.0	38 6.3	150.6	71 45.4	60.3	52 13.4	140.8	30 22.6	154.3	50 30.6	142.3	68 6.8	112.5	64 [illegible]	136.3	35 50.7	167.2
36	59 8.0	130.5	37 43.0	149.4	71 4.7	60.8	51 43.5	139.4	30 2.0	153.2	50 1.6	140.9	67 23.5	111.2	64 [illegible]	134.9	35 28.2	166.8
40	58 32.1	129.0	37 18.9	148.3	70 23.8	61.2	51 12.7	138.0	29 40.6	152.2	49 31.8	139.6	66 39.8	109.9	64 [illegible]	133.4	35 4.9	166.4
44	57 55.5	127.6	36 53.9	147.1	69 42.9	61.6	50 41.1	136.7	29 18.6	151.2	49 1.9	138.3	65 55.9	108.7	64 [illegible]	131.9	34 40.9	166.0
48	57 18.2	126.2	36 28.3	146.0	69 2.0	62.0	50 8.7	135.4	28 55.7	150.2	48 29.8	137.0	65 11.5	107.6	64 [illegible]	130.7	34 16.1	165.6
52	56 40.3	124.9	36 1.8	144.9	68 20.8	62.3	49 35.5	134.1	28 32.2	149.2	47 57.6	135.7	64 36.9	106.5	64 [illegible]	129.4	33 50.6	165.2
1 56	56 1.8	123.6	35 34.7	143.9	67 39.4	62.5	49 2.7	132.8	28 8.0	148.2	47 24.7	134.5	63 42.1	105.4	64 [illegible]	128.1	33 24.4	164.8
2 0	55 22.7	122.4	35 6.8	142.8	66 58.0	62.8	48 27.2	131.6	27 43.2	147.2	46 51.0	133.3	62 57.0	104.4	62 [illegible]	126.8	32 57.3	164.4
4	54 43.0	121.2	34 38.3	141.7	66 16.5	63.0	47 52.0	130.4	27 17.6	146.3	46 16.8	132.1	62 11.7	103.4	62 [illegible]	125.6	32 29.7	164.0
8	54 2.9	120.0	34 9.1	140.7	65 34.8	63.1	47 16.2	129.3	26 51.4	145.3	45 41.9	130.9	61 26.3	102.4	62 [illegible]	124.4	32 2.0	163.6
12	53 22.3	118.8	33 39.2	139.7	64 53.3	63.2	46 39.8	128.1	26 24.5	144.4	45 6.4	129.8	60 40.8	101.5	62 [illegible]	123.3	31 34.4	163.2
16	52 41.2	117.7	33 8.6	138.6	64 11.8	63.3	46 2.8	127.0	25 57.0	143.4	44 30.3	128.7	59 55.0	100.6	62 [illegible]	122.1	31 2.8	162.8
20	51 59.7	116.6	32 37.6	137.6	63 30.1	63.4	45 25.3	125.9	25 28.9	142.5	43 53.7	127.6	59 9.0	99.7	62 [illegible]	120.8	30 32.7	162.4
24	51 17.9	115.6	32 5.8	136.6	62 48.2	63.5	44 47.3	124.8	25 0.2	141.6	43 16.4	126.5	58 23.0	98.9	62 [illegible]	119.6	30 1.9	162.0
28	50 35.6	114.5	31 33.5	135.7	62 6.6	63.5	44 8.8	123.7	24 31.0	140.7	42 38.6	125.5	57 36.9	98.1	62 [illegible]	118.5	29 30.5	161.6
32	49 53.2	113.5	31 0.7	134.7	61 24.7	63.5	43 29.8	122.7	24 1.1	139.8	42 0.4	124.4	56 50.7	97.3	62 [illegible]	117.4	28 58.3	161.2
36	49 10.2	112.5	30 27.2	133.8	60 43.0	63.5	42 50.2	121.7	23 30.8	138.9	41 21.8	123.4	56 4.4	96.5	62 [illegible]	116.3	28 26.0	160.8
40	48 26.9	111.6	29 53.3	132.8	60 1.3	63.5	42 10.3	120.7	23 0.2	138.0	40 42.6	122.4	55 18.0	95.8	62 [illegible]	115.2	27 53.0	160.4
44	47 43.4	110.6	29 18.8	131.9	59 19.6	63.5	41 30.1	119.7	22 28.3	137.1	40 3.0	121.4	54 31.7	95.1	62 [illegible]	114.0	27 19.3	160.0
48	46 59.6	109.7	28 43.8	131.0	58 38.0	63.4	40 49.3	118.7	21 56.3	136.3	39 23.1	120.5	53 45.2	94.3	62 [illegible]	112.8	26 45.2	159.7
52	46 15.6	108.8	28 8.4	130.1	57 56.2	63.4	40 8.3	117.8	21 23.8	135.4	38 42.7	119.5	52 58.6	93.7	62 [illegible]	111.7	26 10.7	159.3
2 56	45 31.3	107.9	27 32.5	129.2	57 14.6	63.3	39 26.8	116.9	20 50.9	134.6	38 2.0	118.6	52 12.1	92.9	62 [illegible]	110.5	25 35.6	158.9
3 0	44 47.0	107.1	26 56.1	128.3	56 32.9	63.2	38 45.1	116.0	20°17.4	133.7	37 20.8	117.7	51 25.6	92.2	62 [illegible]	109.4	25 0.1	158.5
4	44 2.2	106.2	26 19.3	127.4	55 51.4	63.1	38 3.0	115.1	19 43.3	132.9	36 39.3	116.8	50 39.0	91.6	62 [illegible]	108.4	24 24.2	158.1
8	43 17.4	105.4	25 42.1	126.6	55 9.7	63.0	37 20.6	114.2	19 9.2	132.1	35 57.6	115.9	49 52.3	90.9	62 [illegible]	107.3	23 47.7	157.8
12	42 32.3	104.6	25 4.4	125.7	54 28.2	62.8	36 37.9	113.3	18 34.3	131.3	35 15.5	115.1	49 5.5	90.2	62 [illegible]	106.2	23 11.2	157.4
16	41 47.1	103.8	24 26.4	124.9	53 46.8	62.7	35 54.9	112.5	17 59.1	130.5	34 33.1	114.2	48 19.0	89.7	62 [illegible]	105.1	22 33.8	157.0
20	41 1.7	103.0	23 47.9	124.1	53 5.4	62.6	35 11.7	111.6	17 23.4	129.7	33 50.4	113.4	47 32.5	89.1	62 [illegible]	104.0	21 56.1	156.7
24	40 16.3	102.2	23 9.1	123.2	52 24.0	62.4	34 28.2	110.8	16 47.3	128.9	33 7.4	112.5	46 45.8	88.4	62 [illegible]	102.9	21 18.0	156.3
28	39 30.6	101.5	22 29.9	122.4	51 42.8	62.2	33 44.5	110.0	16 10.9	128.2	32 24.3	111.7	45 59.2	87.8	62 [illegible]	101.8	20 39.6	155.9
32	38 44.9	100.7	21 50.4	121.6	51 1.5	62.1	33 0.7	109.2	15 34.0	127.4	31 40.8	110.9	45 12.6	87.2	62 [illegible]	100.7	20 1.2	155.5
36	37 59.0	99.9	21 10.5	120.9	50 20.3	61.9	32 16.5	108.4	14 56.7	126.6	30 57.2	110.1	44 26.0	86.6	62 [illegible]	99.6	19 21.8	155.1
40	37 13.6	99.2	20 30.4	120.1	49 39.3	61.7	31 32.1	107.6	14 19.2	125.9	30 13.2	109.3	43 39.5	86.0	62 [illegible]	98.5	18 42.3	154.8
44	36 26.9	98.5	19 49.8	119.3	48 58.2	61.5	30 47.6	106.9	13 41.2	125.2	29 29.2	108.5	42 53.0	85.5	62 [illegible]	97.4	18 2.5	154.4
48	35 40.8	97.8	19 9.0	118.5	48 17.3	61.3	30 2.9	106.1	13 2.9	124.4	28 44.9	107.8	42 6.5	84.9	62 [illegible]	96.3	17 22.4	154.0
52	34 54.6	97.1	18 28.0	117.8	47 36.4	61.1	29 18.0	105.4	12 24.3	123.7	28 0.4	107.0	41 20.1	84.4	62 [illegible]	95.2	16 42.9	153.7
3 56	34 8.4	96.4	17 46.5	117.0	46 55.7	60.8	28 32.9	104.6	11 45.4	123.0	27 15.6	106.3	40 33.7	83.8	62 [illegible]	94.1	16 1.3	153.3
4 0	33 22.0	95.7	17 4.8	116.3	46 15.0	60.6	27 47.8	103.9	11 5.9	122.3	26 30.8	105.5	39 47.4	83.3	62 [illegible]	93.0	15 20.3	153.0
4	32 35.3	95.0	16 22.9	115.6	45 34.4	60.4	27 2.4	103.2	10 26.4	121.6	25 45.8	104.8	39 1.2	82.7	62 [illegible]	91.9	14 39.0	152.6
8	31 49.0	94.4	15 40.7	114.8	44 54.0	60.2	26 17.0	102.4	9 46.6	120.9	25 0.7	104.1	38 14.9	82.2	62 [illegible]	90.8	13 57.4	152.2
12	31 2.5	93.7	14 58.4	114.1	44 13.7	59.9	25 31.3	101.7	9 6.4	120.2	24 15.3	103.4	37 28.7	81.6	62 [illegible]	89.7	13 15.7	151.8
16	30 16.0	93.1	14 15.6	113.4	43 33.4	59.6	24 45.6	101.0	8 26.0	119.5	23 30.0	102.7	36 42.7	81.1	62 [illegible]	88.6	12 33.6	151.4
20	29 29.4	92.4	13 32.8	112.7	42 53.1	59.4	23 59.9	100.3	7 45.3	118.8	22 44.4	102.0	35 56.7	80.5	62 [illegible]	87.5	11 51.3	151.0
24	28 42.8	91.8	12 49.6	112.0	42 12.1	59.2	23 13.9	99.6	7 4.3	118.1	21 58.7	101.3	35 10.6	80.0	62 [illegible]	86.4	11 8.8	150.7
28	27 56.2	91.1	12 6.3	111.3	41 31.1	58.9	22 27.9	99.0	6 23.0	117.4	21 13.9	100.6	34 24.8	79.5	62 [illegible]	85.3	10 25.9	150.4
32	27 9.6	90.5	11 22.8	110.6	40 53.3	58.6	21 41.8	98.3	5 41.4	116.8	20 27.1	99.9	33 39.0	78.9	62 [illegible]	84.2	9 42.9	150.1
36	26 23.0	89.9	10 39.0	110.0	40 13.6	58.3	20 55.6	97.6	4 59.8	116.1	19 41.1	99.2	32 53.2	78.4	62 [illegible]	83.1	8 59.7	149.8
40	25 36.3	89.2	9 55.0	109.3	39 34.0	58.0	20 9.4	96.9	4 17.6	115.4	18 55.0	98.6	32 7.6	77.9	62 [illegible]	82.0	8 16.4	149.5
44	24 49.7	88.6	9 11.0	108.6	38 54.4	57.7	19 23.0	96.3	3 35.4	114.8	18 8.9	97.9	31 22.1	77.4	62 [illegible]	80.9	7 33.2	149.2
48	24 3.1	88.0	8 26.7	107.9	38 15.1	57.4	18 36.6	95.6	2 52.9	114.2	17 22.7	97.3	30 36.6	76.8	62 [illegible]	79.8	6 49.0	148.9
52	23 16.6	87.4	7 42.2	107.3	37 35.9	57.1	17 50.2	95.0	2 10.2	113.5	16 36.4	96.6	29 51.3	76.3	62 [illegible]	78.7	6 5.0	148.6
4 56	22 29.9	86.8	6 37.6	106.6	36 56.8	56.8	17 3.8	94.3	1 27.4	112.9	15 50.1	95.9	29 6.0	75.8	62 [illegible]	77.6	5 20.9	148.3
5 0	21 43.5	86.2	6 12.9	106.0	36 17.9	56.5	16 17.3	93.7	0 44.4	112.2	15 3.6	95.3	28 20.9	75.3	62 [illegible]	76.5	4 36.6	148.0
4	20 56.9	85.5	5 28.0	105.3	35 39.1	56.2	15 30.7	93.0	0 1.2	111.6	14 17.2	94.6	27 35.8	74.7	62 [illegible]	75.4	3 52.1	147.8
8	20 10.4	84.9	4 42.9	104.7	35 0.2	55.9	14 44.1	92.4			13 30.7	94.0	26 50.8	74.2	62 [illegible]	74.3	3 7.4	147.5
12	19 24.1	84.3	3 57.7	104.0	34 21.9	55.5	13 57.5	91.8			12 44.1	93.3	26 6.0	73.7	62 [illegible]	73.2	2 22.7	147.2
16	18 37.6	83.7	3 12.5	103.4	33 43.5	55.2	13 10.9	91.1			11 57.6	92.7	25 21.3	73.1	62 [illegible]	72.1	1 37.7	146.9
20	17 51.3	83.1	2 27.0	102.8	33 5.3	54.9	12 24.3	90.5			11 11.0	92.1	24 36.7	72.6	62 [illegible]	71.0	0 52.1	146.6
24	17 5.0	82.5	1 41.5	102.1	32 27.2	54.5	11 37.7	89.9			10 24.4	91.4	23 52.3	72.1	62 [illegible]	69.9	0 6.6	146.3
28	16 18.9	81.9	0 55.9	101.5	31 49.4	54.2	10 51.1	89.2			9 37.8	90.8	23 8.1	71.6	62 [illegible]	68.8		
32	15 32.7	81.4	0 10.3	100.9	31 11.6	53.8	10 4.4	88.6			8 51.1	90.2	22 24.0	71.1	62 [illegible]	67.9		
36	14 46.6	80.8			30 34.1	53.5	9 17.8	88.0			8 4.5	89.5	21 39.9	70.5	62 [illegible]			
40	14 0.6	80.2			29 56.8	53.1	8 31.2	87.3			7 17.9	88.9	20 56.0	70.0	62 [illegible]			
44	13 14.8	79.6			29 19.6	52.8	7 44.7	86.7			6 31.3	88.3	20 12.2	69.5	62 [illegible]			
48	12 28.9	79.0			28 42.5	52.4	6 58.2	86.1			5 44.7	87.6	19 28.7	69.0	62 [illegible]			
52	11 43.3	78.4			28 5.7	52.0	6 11.8	85.5			4 58.1	87.0	18 45.3	68.4	62 [illegible]			
5 56	10 57.5	77.8			27 29.0	51.6	5 25.2	84.9			4 11.6	86.4	18 2.0	67.9	62 [illegible]			
6 0	10 12.0	77.2			26 52.6	51.3	4 38.8	84.2			3 25.0	85.8	17 18.9	67.4	62 [illegible]			

β Gemin. Pollux		α Leonis Regulus		α Virginis Spica		α Boötis Arcturus		α Scorpii Antares		α Lyræ Vega		α Aquilæ Altair		α Cygni Deneb		α Pisc. Aust. Fomalhaut		Hour Angle
Dec.+28° 13′.4		Dec.+12° 21′.9		Dec.−10° 44′.3		Dec.+19° 36′.3		Dec.−26° 15′.2		Dec.+38° 42′.4		Dec.+8° 39′.2		Dec.+44° 59′.4		Dec.−30° 03′.2		
Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	h. m.
° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	° ′	°	
13.4	180.0	6 22	180.0	40 15.7	180.0	70 36.3	180.0	24 44.8	180.0	89 42.4	180.0	59 39.2	180.0	84 0.6	0.0	20 56.8	180.0	0 0
11.3	175.2	6 22	177.8	40 15.1	178.7	70 35.3	177.1	24 44.4	179.0	89 4.7	110.3	59 38.4	178.0	83 57.8	6.7	20 56.4	179.0	4
5.7	170.6	6 22	175.6	40 13.7	177.4	70 31.9	174.3	24 43.2	178.0	88 21.5	100.0	59 36.1	176.1	83 49.8	13.3	20 55.2	178.1	8
56.4	166.1	6 22	173.4	40 11.0	176.1	70 26.2	171.5	24 41.2	177.0	87 36.3	96.2	59 32.1	174.1	83 36.5	19.4	20 53.4	177.2	12
43.4	161.7	6 22	170.3	40 7.4	174.9	70 18.1	168.8	24 38.4	176.0	86 50.4	94.1	59 26.7	172.2	83 18.8	25.1	20 50.8	176.3	16
27.2	157.4	6 21	169.2	40 2.6	173.6	70 7.9	166.0	24 34.8	175.0	86 4.1	92.7	59 19.5	170.3	82 57.0	30.2	20 47.3	175.4	20
7.7	153.4	6 21	167.1	39 56.9	172.3	69 55.6	163.3	24 30.4	174.0	85 17.8	91.7	59 10.9	168.4	82 31.9	34.7	20 43.3	174.4	24
45.3	149.6	6 21	165.0	39 50.2	171.0	69 41.1	160.7	24 25.2	173.0	84 31.4	90.9	59 0.8	166.5	82 4.0	38.7	20 38.4	173.5	28
20.5	146.0	6 21	162.9	39 42.3	169.8	69 24.8	158.1	24 19.2	172.0	83 44.8	90.2	58 50.4	164.6	81 34.1	42.2	20 32.8	172.6	32
53.3	142.6	6 21	160.9	39 33.5	168.5	69 6.3	155.6	24 12.4	171.1	82 58.2	89.6	58 36.0	162.7	81 1.9	45.2	20 26.4	171.7	36
24.0	139.4	6 21	158.9	39 23.7	167.3	68 46.3	153.1	24 4.9	170.2	82 11.6	89.0	58 21.3	160.9	80 28.0	47.9	20 19.3	170.8	40
52.8	136.4	6 21	156.9	39 13.0	166.0	68 24.2	150.8	23 56.5	169.2	81 25.2	88.5	58 5.5	159.1	79 52.9	50.2	20 11.4	169.8	44
19.7	133.7	6 21	155.0	39 1.2	164.8	68 0.7	148.5	23 47.4	168.2	80 38.7	88.0	57 48.1	157.3	79 16.3	52.2	20 2.9	168.9	48
45.3	131.1	6 21	153.1	38 48.5	163.5	67 35.5	146.2	23 37.5	167.2	79 52.1	87.6	57 29.5	155.6	78 39.1	54.0	19 53.5	168.0	52
9.5	128.7	6 21	151.3	38 34.7	162.3	67 8.7	144.1	23 26.8	166.3	79 5.6	87.1	57 9.4	153.8	78 1.9	55.5	19 43.5	167.1	0 56
32.5	126.4	6 21	149.4	38 20.1	161.1	66 40.7	142.0	23 15.5	165.4	78 19.2	86.7	56 48.3	152.2	77 22.4	56.9	19 32.8	166.2	1 0
54.3	124.3	6 21	147.6	38 4.6	159.9	66 11.4	140.0	23 3.3	164.4	77 32.8	86.3	56 25.9	150.5	76 43.1	58.1	19 21.4	165.3	4
15.3	122.3	6 21	145.9	37 48.1	158.7	65 41.8	138.0	22 50.4	163.5	76 46.3	85.9	56 2.4	148.9	76 3.3	59.1	19 9.3	164.4	8
35.5	120.4	6 21	144.2	37 30.6	157.5	65 9.0	136.1	22 36.8	162.6	75 59.7	85.5	55 37.6	147.3	75 23.0	60.0	18 56.4	163.5	12
55.0	118.7	6 21	142.5	37 12.3	156.4	64 36.2	134.3	22 22.4	161.6	75 13.2	85.1	55 12.9	145.7	74 42.4	60.8	18 42.9	162.6	16
13.7	117.0	6 21	140.9	36 53.2	155.2	64 2.3	132.6	22 7.4	160.7	74 26.8	84.8	54 48.1	144.1	74 1.6	61.5	18 28.6	161.8	20
31.8	115.5	6 21	139.3	36 33.2	154.0	63 27.6	130.9	21 51.6	159.7	73 40.5	84.4	54 17.3	142.6	73 20.6	62.2	18 13.8	160.9	24
49.6	114.0	6 21	137.8	36 12.4	152.9	62 52.9	129.3	21 35.1	158.8	72 54.2	84.0	53 45.5	141.2	72 39.3	62.7	17 58.1	160.1	28
6.8	112.5	6 21	136.3	35 50.7	151.7	62 15.5	127.7	21 17.8	157.9	72 7.8	83.7	53 14.8	139.7	71 57.7	63.2	17 41.9	159.2	32
23.5	111.1	6 21	134.9	35 28.2	150.6	61 38.2	126.2	21 0.0	157.0	71 21.4	83.3	52 48.3	138.3	71 16.1	63.6	17 25.1	158.3	36
39.8	109.9	6 21	133.4	35 4.9	149.5	61 0.3	124.7	20 41.5	156.1	70 35.1	82.9	52 18.8	136.9	70 34.2	64.0	17 7.6	157.5	40
55.9	108.7	6 21	132.0	34 40.9	148.4	60 21.6	123.4	20 22.2	155.2	69 48.9	82.6	51 44.5	135.6	69 52.2	64.3	16 49.4	156.6	44
11.5	107.6	6 21	130.7	34 16.1	147.4	59 42.4	122.0	20 2.3	154.3	69 2.7	82.2	51 11.5	134.3	69 10.2	64.6	16 30.6	155.8	48
26.9	106.5	6 21	129.4	33 50.6	146.3	59 2.5	120.7	19 41.8	153.4	68 16.5	81.9	50 37.8	133.0	68 28.1	64.8	16 11.2	155.0	52
42.1	105.4	6 21	128.1	33 24.4	145.2	58 22.2	119.4	19 20.6	152.6	67 30.3	81.5	50 3.3	131.7	67 45.8	65.0	15 51.1	154.1	1 56
57.0	104.4	6 21	126.8	32 57.3	144.2	57 41.4	118.2	18 58.8	151.7	66 44.2	81.2	49 28.1	130.5	67 3.5	65.1	15 30.5	153.3	2 0
11.7	103.4	6 21	125.6	32 29.7	143.1	57 0.0	117.0	18 36.4	150.8	65 58.3	80.8	48 52.4	129.3	66 21.3	65.3	15 9.2	152.5	4
26.3	102.4	6 21	124.4	32 1.4	142.1	56 18.4	115.9	18 13.3	150.0	65 12.2	80.5	48 15.9	128.1	65 38.9	65.4	14 47.5	151.7	8
40.8	101.5	6 21	123.3	31 32.4	141.1	55 36.2	114.7	17 49.6	149.1	64 26.3	80.1	47 38.9	126.9	64 56.4	65.4	14 25.0	150.9	12
55.0	100.6	6 21	122.1	31 2.8	140.1	54 53.6	113.6	17 25.5	148.3	63 40.5	79.8	47 1.4	125.8	64 14.1	65.5	14 2.1	150.1	16
9.0	99.7	6 21	120.9	30 32.7	139.1	54 10.7	112.6	17 0.7	147.4	62 54.6	79.4	46 23.4	124.7	63 31.6	65.5	13 38.5	149.3	20
23.0	98.9	6 21	119.8	30 1.9	138.2	53 27.6	111.6	16 35.3	146.6	62 8.7	79.0	45 44.8	123.6	62 49.2	65.5	13 14.4	148.5	24
36.9	98.1	6 21	118.7	29 30.5	137.2	52 44.0	110.6	16 9.4	145.8	61 23.0	78.7	45 5.9	122.6	62 6.7	65.5	12 49.7	147.7	28
50.7	97.3	6 21	117.6	28 58.8	136.3	52 0.2	109.6	15 42.9	145.0	60 37.3	78.3	44 26.2	121.5	61 24.3	65.5	12 24.6	146.9	32
4.4	96.5	6 21	116.5	28 26.0	135.3	51 16.2	108.6	15 16.0	144.2	59 51.7	78.0	43 46.2	120.5	60 42.0	65.4	11 58.9	146.2	36
18.0	95.8	6 21	115.4	27 53.0	134.4	50 31.9	107.7	14 48.4	143.4	59 6.1	77.6	43 5.8	119.5	59 59.6	65.4	11 32.6	145.4	40
31.7	95.1	6 21	114.3	27 19.3	133.5	49 47.3	106.8	14 20.4	142.6	58 20.6	77.3	42 25.1	118.5	59 17.2	65.3	11 5.9	144.6	44
45.2	94.3	6 21	113.2	26 45.2	132.6	49 2.6	105.9	13 51.8	141.8	57 35.2	76.9	41 43.9	117.6	58 34.7	65.2	10 38.7	143.9	48
58.6	93.7	6 21	112.1	26 10.7	131.7	48 17.7	105.0	13 22.7	141.0	56 49.8	76.6	41 2.4	116.6	57 52.4	65.1	10 11.0	143.1	52
12.1	93.0	6 21	111.0	25 35.6	130.8	47 32.6	104.2	12 53.1	140.3	56 4.5	76.2	40 20.5	115.7	57 10.1	65.0	9 42.8	142.4	2 56
25.6	92.3	6 21	109.9	25 0.1	130.0	46 47.2	103.4	12 23.0	139.5	55 19.2	75.9	39 38.4	114.8	56 28.0	64.9	9 24.1	141.7	3 0
39.0	91.6	6 21	108.8	24 24.2	129.1	46 2.8	102.6	11 52.6	138.7	54 33.9	75.5	38 56.0	113.9	55 45.8	64.7	8 44.9	140.9	4
51.3	90.9	6 21	107.7	23 47.7	128.3	45 16.2	101.8	11 21.6	138.0	53 48.9	75.2	38 13.2	113.0	55 3.7	64.5	8 15.3	140.2	8
5.7	90.3	6 21	106.5	23 10.9	127.4	44 30.6	101.0	10 50.2	137.3	53 3.8	74.8	37 30.1	112.2	54 21.6	64.4	7 45.2	139.5	12
19.0	89.7	6 21	105.3	22 34.0	126.6	43 44.6	100.2	10 18.4	136.5	52 18.8	74.4	36 46.8	111.3	53 39.5	64.3	7 14.8	138.8	16
32.5	89.1	6 21	104.0	21 56.1	125.8	42 58.7	99.5	9 46.1	135.8	51 34.0	74.1	36 3.1	110.5	52 57.6	64.1	6 43.9	138.1	20
45.8	88.4	6 21	102.8	21 18.0	125.0	42 12.8	98.7	9 13.3	135.1	50 49.2	73.7	35 19.4	109.7	52 15.7	63.9	6 12.5	137.4	24
59.2	87.8	6 21	101.6	20 39.8	124.2	41 26.6	98.0	8 40.2	134.4	50 4.5	73.4	34 35.3	108.9	51 33.8	63.7	5 40.8	136.7	28
12.6	87.2	6 21	100.4	20 0.9	123.4	40 40.4	97.3	8 6.6	133.6	49 19.8	73.0	33 51.1	108.1	50 52.1	63.5	5 8.7	136.0	32
26.0	86.6	6 21	99.2	19 21.8	122.6	39 54.0	96.6	7 32.7	132.9	48 35.3	72.6	33 6.7	107.3	50 10.4	63.3	4 36.1	135.4	36
39.5	86.0	6 21	98.1	18 42.3	121.8	39 7.8	95.9	6 58.4	132.3	47 50.9	72.3	32 22.1	106.5	49 28.7	63.1	4 3.1	134.7	40
53.0	85.5	6 21	96.9	18 2.5	121.1	38 21.3	95.2	6 23.7	131.6	47 6.5	71.9	31 37.3	105.7	48 47.3	62.9	3 29.7	134.0	44
6.5	84.9	6 21	95.8	17 22.4	120.3	37 34.9	94.5	5 48.7	130.9	46 22.2	71.5	30 52.3	105.0	48 5.8	62.6	2 56.0	133.4	48
20.1	84.4	6 21	94.6	16 41.9	119.6	36 48.3	93.8	5 13.2	130.2	45 38.0	71.2	30 7.2	104.2	47 24.5	62.4	2 22.0	132.7	52
33.7	83.8	6 21	93.4	16 1.3	118.8	36 1.9	93.2	4 37.4	129.5	44 54.0	70.8	29 21.9	103.5	46 43.1	62.2	1 47.6	132.1	3 56
47.4	83.3	6 21	92.3	15 20.3	118.2	35 15.3	92.5	4 1.2	128.9	44 10.0	70.4	28 36.6	102.8	46 2.0	61.9	1 12.8	131.4	4 0
1.2	82.7	6 21	91.1	14 39.0	117.4	34 28.7	91.9	3 24.8	128.2	43 26.1	70.0	27 51.0	102.1	45 20.9	61.7	0 37.6	130.8	4
14.9	82.1	6 21	89.9	13 57.4	116.7	33 42.1	91.2	2 48.0	127.5	42 42.3	69.7	27 5.3	101.4	44 39.9	61.4	0 2.0	130.2	8
28.7	81.6	6 21	88.7	13 15.7	115.9	32 55.5	90.6	2 10.9	126.9	41 58.6	69.3	26 19.6	100.7	43 59.1	61.1			12
42.7	81.1	6 21	87.5	12 33.6	115.2	32 8.8	89.9	1 33.4	126.2	41 15.1	68.9	25 33.7	100.0	43 18.3	60.9			16
56.7	80.5	6 21	86.3	11 51.3	114.5	31 22.2	89.3	0 55.7	125.6	40 31.6	68.5	24 47.7	99.3	42 37.6	60.6			20
10.6	80.0	6 21	85.1	11 8.8	113.8	30 35.6	88.7	0 17.8	125.0	39 48.3	68.1	24 1.7	98.6	41 56.9	60.3			24
24.8	79.5	6 21	83.9	10 25.9	113.2	29 48.9	88.1			39 5.1	67.7	23 15.5	97.9	41 16.3	60.0			28
39.0	78.9	6 21	82.7	9 42.9	112.5	29 2.3	87.5			38 22.0	67.3	22 29.4	97.2	40 36.2	59.7			32
53.2	78.4	6 21	81.5	8 59.7	111.8	28 15.8	86.9			37 39.0	67.0	21 43.0	96.6	39 56.0	59.4			36
7.6	77.9	6 21	80.3	8 16.4	111.1	27 29.3	86.3			36 56.3	66.6	20 56.6	95.9	39 15.8	59.1			40
22.1	77.4	6 21	79.1	7 32.8	110.4	26 42.8	85.7			36 13.5	66.2	20 10.2	95.2	38 35.9	58.8			44
36.6	76.8	6 21	77.9	6 49.0	109.8	25 56.3	85.1			35 30.9	65.8	19 23.8	94.6	37 56.1	58.5			48
51.3	76.3	6 20	76.7	6 5.0	109.1	25 9.8	84.5			34 48.5	65.4	18 37.3	93.9	37 16.4	58.2			52
6.0	75.8	6 20	75.5	5 20.9	108.5	24 23.4	83.9			34 6.2	65.0	17 50.8	93.3	36 36.8	57.9			4 56
20.9	75.3	6 19	74.3	4 36.6	107.8	23 37.1	83.3			33 24.0	64.5	17 4.2	92.6	35 57.4	57.6			5 0
35.8	74.7	6 18	73.1	3 52.1	107.2	22 50.8	82.7			32 42.0	64.1	16 17.7	92.0	35 18.2	57.2			4
50.8	74.2	6 17	71.9	3 7.4	106.5	22 4.6	82.1			32 0.0	63.7	15 31.0	91.4	34 39.0	56.9			8
6.0	73.7	6 17	70.7	2 22.7	105.9	21 18.4	81.5			31 18.3	63.3	14 44.4	90.7	34 0.0	56.6			12
21.3	73.2	6 16	69.5	1 37.7	105.2	20 32.4	80.9			30 36.7	62.9	13 57.8	90.1	33 21.2	56.2			16
36.7	72.6	6 15	68.3	0 52.1	104.6	19 46.4	80.3			29 55.3	62.5	13 11.1	89.5	32 42.6	55.9			20
52.3	72.1	6 14	67.1	0 6.0	104.0	19 0.5	79.8			29 14.1	62.1	12 24.5	88.9	32 4.0	55.5			24
8.1	71.6	6 13	65.9			18 14.6	79.2			28 33.0	61.6	11 38.0	88.2	31 25.7	55.2			28
24.0	71.1	6 12	64.7			17 28.8	78.6			27 52.1	61.2	10 51.3	87.6	30 47.5	54.8			32
39.9	70.5	6 11	63.5			16 43.2	78.0			27 11.3	60.8	10 4.7	87.0	30 9.5	54.4			36
56.0	70.0	6 10	62.4			15 57.7	77.5			26 30.7	60.3	9 18.1	86.4	29 31.7	54.1			40
12.2	69.5	6 9	61.2			15 12.2	76.9			25 50.3	59.9	8 31.7	85.7	28 54.0	53.7			44
28.7	69.0	6 8	60.0			14 26.8	76.3			25 10.0	59.4	7 45.2	85.1	28 16.5	53.3			48
45.3	68.4	6 7	58.8			13 41.6	75.7			24 29.9	59.0	6 58.8	84.5	27 39.2	52.9			52
2.0	67.9	6 6	57.6			12 56.4	75.1			23 50.1	58.5	6 12.3	83.9	27 2.0	52.6			5 56
18.9	67.4	6 5	56.3			12 11.4	74.5			23 10.5	58.1	5 26.0	83.3	26 25.1	52.2			6 0

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8.9	67.4	7.3			12 11.4	74.5			23 10.5	58.1	5 26.0	83.3	26 25.1	52.2			6 0

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WYOMING
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COLORADO
ARIZONA
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
TEXAS
MEXICO
PACIFIC OCEAN
GULF OF CALIFORNIA
LOWER CALIFORNIA
COLUMBIA RIVER
MISSOURI RIVER
COLORADO RIVER
RIO GRANDE
Seattle
Spokane
Moscow
Walla Walla
Salem
Albany
Eugene
Roseburg
Weiser
Boise
Great Falls
Glasgow
Lewistown
Billings
Livingston
Dillon
Helena
Butte
Missoula
Devils Lake
Bismarck
Dickinson
Jamestown
Aberdeen
Huron
Lead
Deadwood
Hot Springs
Chadron
Ainsworth
O'Neill
Columbus
Broken Bow
Grand Island
North Platte
Kearney
Hastings
McCook
Norton
Ellsworth
Salina
Larned
Anthony
Wichita
Lander
Rock Springs
Evanston
Laramie
Cheyenne
Ft Collins
Greeley
Golden
Leadville
Aspen
Grand Junction
Glenwood Springs
Colorado Springs
Pueblo
Florence
Durango
Trinidad
Raton
Santa Fe
Las Vegas
Albuquerque
Socorro
Roswell
Silver City
Deming
Las Cruces
El Paso
Carlsbad
Amarillo
Childress
Abilene
Ballinger
San Saba
Taylor
Austin
San Antonio
Laredo
Corpus Christi
Fort Worth
Denton
Gainesville
Salt Lake City
Ogden
Logan
Provo
Lehi
Payson
Nephi
Ephraim
Beaver
Eureka
Elko
Carson
Virginia City
Austin
Pioche
Reno
Redding
Red Bluff
Marysville
Sacramento
Stockton
Oakland
San Jose
Santa Cruz
Fresno
Bakersfield
Santa Barbara
Los Angeles
San Diego
Flagstaff
Prescott
Phoenix
Globe
Tucson
Nogales
Yuma
Grand Canyon
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WISCONSIN
MICHIGAN
IOWA
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSOURI
ARKANSAS
MISSISSIPPI
LOUISIANA
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MASSACHUSETTS
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CONVENIENT METHOD OF HANDLING STEAMING DATA

By Lieutenant Jules James, U. S. Navy

To provide a ready means of obtaining steaming data in convenient form the curves below were prepared for one of the ships. With this set of curves and a report of coal on board, the commanding officer will have, ready at hand, all the data necessary to solve the steaming problems which arise from time to time.

These curves were all made from data obtained from a performance sheet furnished by the Office of Gunnery Exercises and Engineering Performances. This performance sheet, illustrated in Fig. 1, was made from actual steaming data recorded during the years 1910 to 1917 and represents performance under all sorts of conditions of coal, boilers, bottoms, weather, etc. A similar sheet is furnished to all vessels of the navy.

The curve shown on this sheet (Fig. 1) was drawn by the author of this article, is the average of the data plotted, and may be assumed to be the probable performance of the vessel under average conditions.

Curves *A*, *B* and *C* were plotted from data taken from the curve (Fig. 1) and converted into the proper co-ordinates, as shown by columns 1 to 7 in Table 1 on page 588.

Curve *A* represents this curve plotted as the ordinary type of coal-consumption curve; that is, tons per day *vs.* knots per hour. (Col. 4 *vs.* col. 1.)

Curves *B*, *C* and *D* are the same curves expressed in different co-ordinates merely to facilitate their uses.

Curve *B* is a curve of miles per ton *vs.* knots per hour. (Col. 5 *vs.* col. 1.)

Curve *C* is a curve of steaming radius *vs.* knots per hour. (Col. 6 *vs.* col. 1.)

Curve *D* is a curve of R. P. M. *vs.* knots per hour. (Col. 8 *vs.* col. 1.) This curve was plotted from the R. P. M. card usually kept on the bridge.

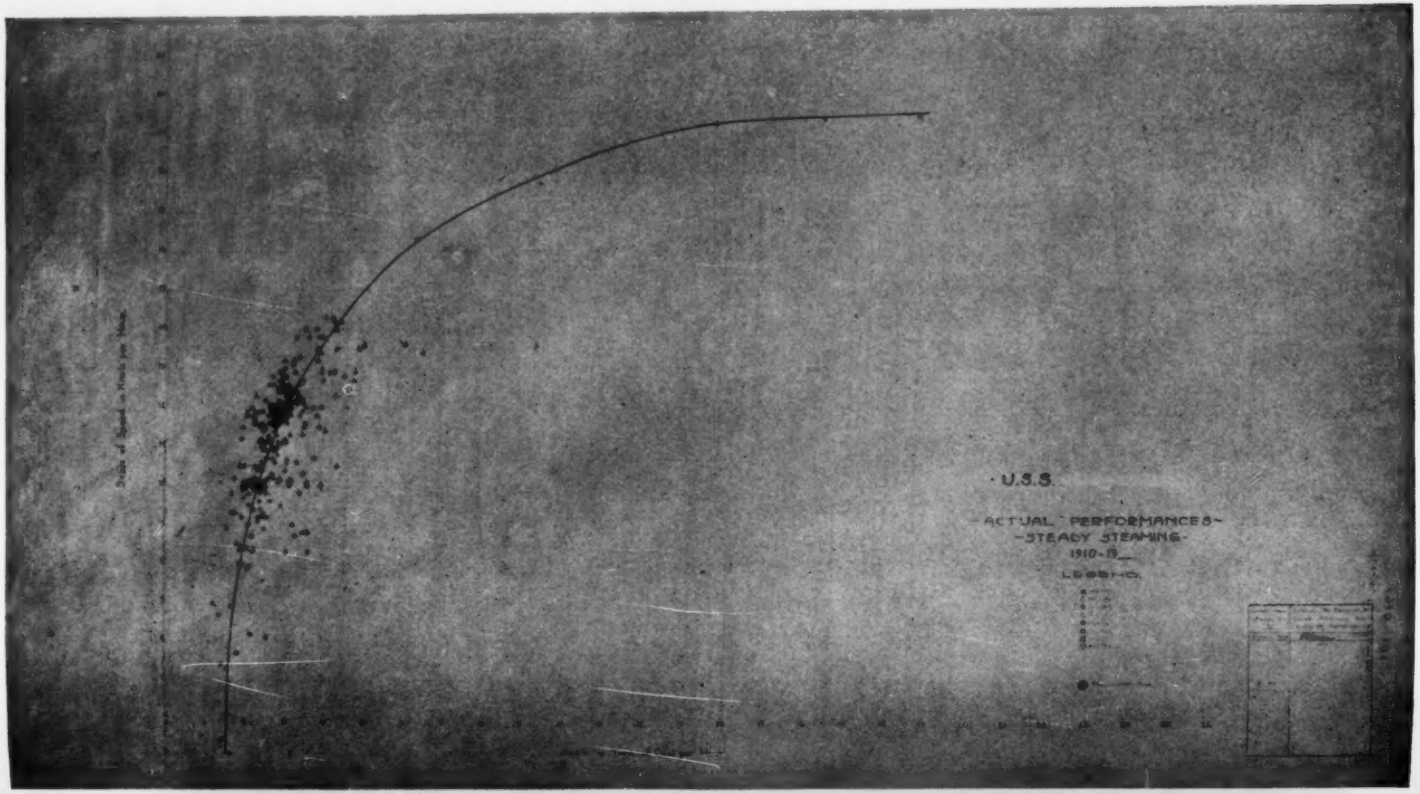

FIG. 1.

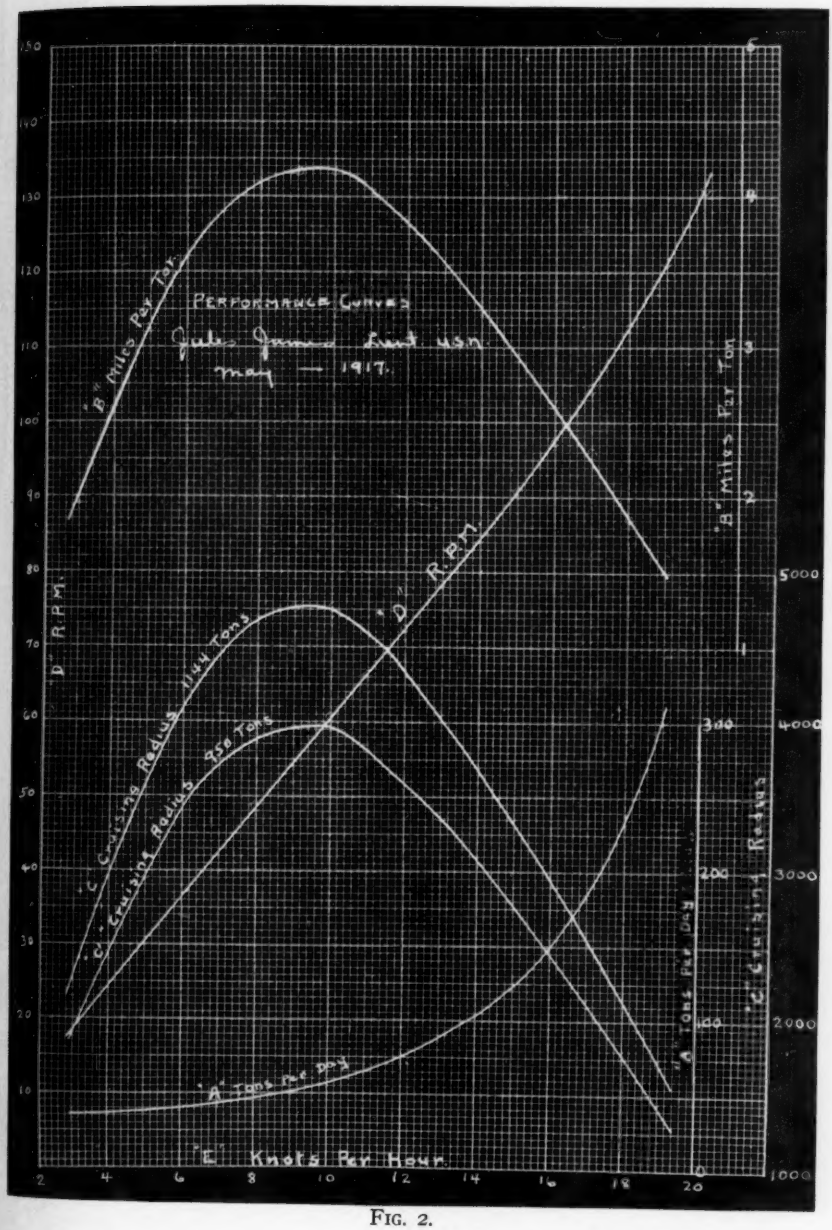
PERFORMANCE CURVES
May — 1917.
'B' Miles Per Ton.
'D' R.P.M.
'C' Cruising Radius 1144 Tons
'C1' Cruising Radius 752 Tons
'A' Tons per day
'E' Knots Per Hour.
'B' Miles Per Ton
'A' Tons Per Day
'C' Cruising Radius

FIG. 2.

FIG. 1.

It is recommended that another curve *C'*, similar to *C* and just below it, be plotted in case certain bunkers are to be kept as reserve bunkers and not ordinarily used. (Col. 7 *vs.* col. 1.) The additional curve would be made out for a fuel capacity equal to the total minus the reserve. In this particular case the reserve is taken as 194 tons.

TABLE 1

Knots per hour	Miles per day Col. 1x24	Tons per hour curve Fig. 1	Tons per day Col. 3x24	Miles per ton Col. 2 Col. 4	Cruising radius 1144 tons Col. 5x1144	Cruising radius 950 tons Col. 5x950
3	72	1.510	36.24	1.990	2277	1891
4	96	1.550	37.20	2.580	2952	2451
5	120	1.600	28.40	3.125	3575	2969
6	144	1.675	40.20	3.582	4098	3403
7	168	1.790	42.96	3.911	4474	3715
8	192	1.955	46.92	4.092	4681	3888
9	216	2.165	51.96	4.157	4756	3949
10	240	2.425	57.66	4.162	4761	3954
11	264	2.735	65.64	4.022	4601	3821
12	288	3.125	75.20	3.840	4393	3648
13	312	3.670	88.08	3.542	4052	3365
14	336	4.330	103.92	3.233	3698	3071
15	360	5.120	122.88	2.930	3352	2784
16	384	6.140	147.37	2.606	2981	2476
17	408	7.630	183.12	2.228	2549	2117
18	432	9.780	234.72	1.841	2106	1749
19	456	12.650	303.60	1.502	1719	1427

It is evident that these curves are equally applicable to coal- and oil-burning vessels.

To illustrate the uses of the sheet, suppose the ship had to make a voyage of 1650 miles on 500 tons of coal. This is 3.3 miles per ton that must be made. A ruler laid across the sheet at 3.3 on the *B* scale cuts the *B* curve at 5.3 knots and at 13.9 knots on the *E* scale at the bottom, so any speed between these two can be used. These speeds give 32 and 84 R. P. M. respectively on curve *D*.

Or let us suppose the ship, with full bunkers, were to receive orders to leave Norfolk for a voyage of 2000 miles. The commanding officer wishes to make all speed possible, but not to draw on his reserve coal. Therefore he uses curve *C'* and entering from 2000 on the *C* scale a horizontal cuts the curve at 17.5 knots which is the maximum speed he can use. The R. P. M. curve shows that this speed is made at 107 R. P. M.

Let us suppose that outside he encounters a storm with consequent delay, and after a day's steaming finds that, having had to ride out the storm, he has used 150 tons of coal and still has 1800 miles to go. He now has available 800 tons to go 1800 miles; therefore, he must make $2\frac{1}{4}$ miles per ton of coal. Entering from $2\frac{1}{4}$ on the *B* scale a horizontal cuts the *B* curve at 16.9 knots per hour: so he is assured that if he slows to 16.9 knots he will make port under present conditions and with his reserve coal intact. Should he encounter another delay, he can again go to the curve and find out his new highest speed to enable him to reach port with his reserve coal. On the other hand, should he be set along his course he can go to the curve and in the same manner find out how much he can increase his speed.

If for any reason he wishes to steam at slow speeds he can continue his horizontal over to the other branch of the curve and find the lowest speed he can maintain to reach port.

If he wishes to reach port with the least expenditure of coal he simply has to look at *B* curve and see that between 9 and 10 knots he can make most miles per ton of coal expended. This place on the curve is clearly the economical speed.

Suppose the ship is under orders to proceed to sea 100 miles, circle for 48 hours at 18 knots and return. He must steam 864 miles in circling. Entering from 19 knots on the *E* scale a vertical line cuts curve *B* at 1.85 miles per ton. Therefore, he will use $864 \div 1.85 = 467$ tons in circling. Suppose he has 550 tons on hand. He will have 83 tons available for the voyage out and back. Therefore, he must make 2.41 miles per ton going out and returning. Entering from 2.41 on the *B* scale a horizontal cuts the *B* curve at 16.5 knots which is the maximum speed he must maintain going out and returning.

The uses of the R. P. M. curve and coal-consumption curve proper are too familiar to require demonstration.

This curve sheet contains all the steaming data required for the solution of all problems in simple steaming, and can conveniently be put on a single sheet of 8″ x 10″ plotting paper convenient for a note-book, or for pasting on a board to be kept in the cabin. It is believed that this method of handling steaming data will be found very convenient and that solutions can be made more quickly, and with less liability to error than when using the usual method of referring to tables of data which have to be interpolated, and

figuring in hours and consumption per hour. Using the curve one actually sees the expected performance and gets better information than when figuring to obtain a single point.

ADDENDUM

At the suggestion of Commander Kalbfus of the Office of Gunnery Exercises and Engineering Performances, the following is added to the article as originally written:

Instead of drawing the single average curve, five curves may be drawn on the performance sheet. These are illustrated by the five light curves in Fig. 3. The central one of these curves (*A-3*) is drawn as the average performance. Two curves are drawn on each side of this curve, *A-1* being the best performance, and the one used by the Department as the standard, while *A-5* is the worst performance curve and is aptly called the "danger curve." The other two are drawn about midway between the middle and the outer curves. The average curve is of course drawn through the centers of the greatest number of spots.

From each one of these five curves a separate set of curves of cruising radius and miles per ton is drawn, as illustrated for a single curve in the original article; and to avoid complication the curves are put on three separate sheets. Fig. 4 represents the five curves of "miles per ton" corresponding to the five performance curves, *A-1, A-2,* etc. Fig. 5 represents the five corresponding curves of "cruising radius" using 1144 tons of coal, and Fig. 6 represents the five corresponding curves of "cruising radius" using 950 tons of coal.

Having the five sets of curves the commanding officer, instead of depending on the average curves can select the curves which coincide with present conditions of steaming, as found by the latest performance of his vessel.

The uses of the curves are exactly the same as illustrated in the original article, except that here the commanding officer selects a set of curves which more closely agrees with his present steaming capacity as influenced by bottom, coal, draft, etc., or, on applying his data for the first day's steaming, selects for use the curves on which these data fall, or interpolate between the two sets of curves between which they fall. The five sets of curves will of course cover all conditions.

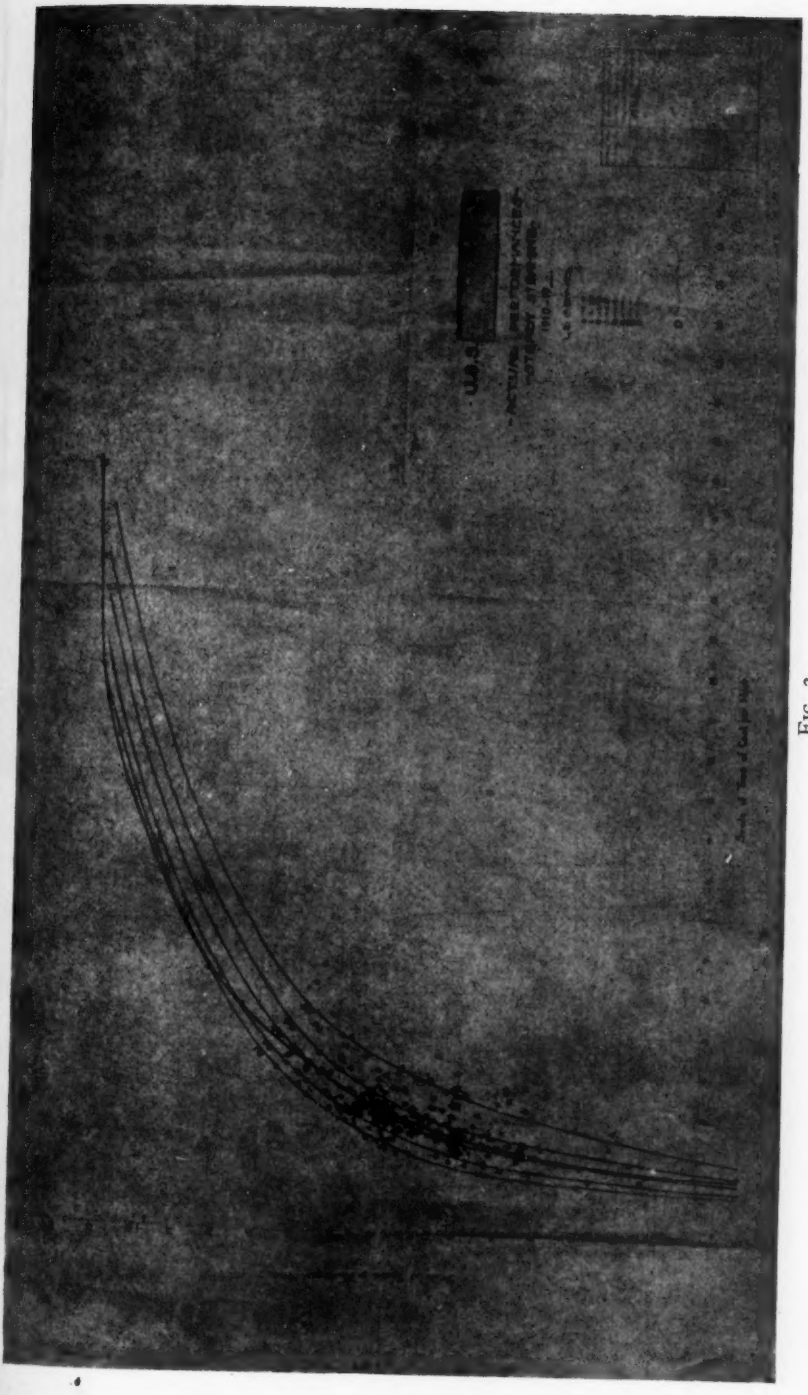

FIG. 3.

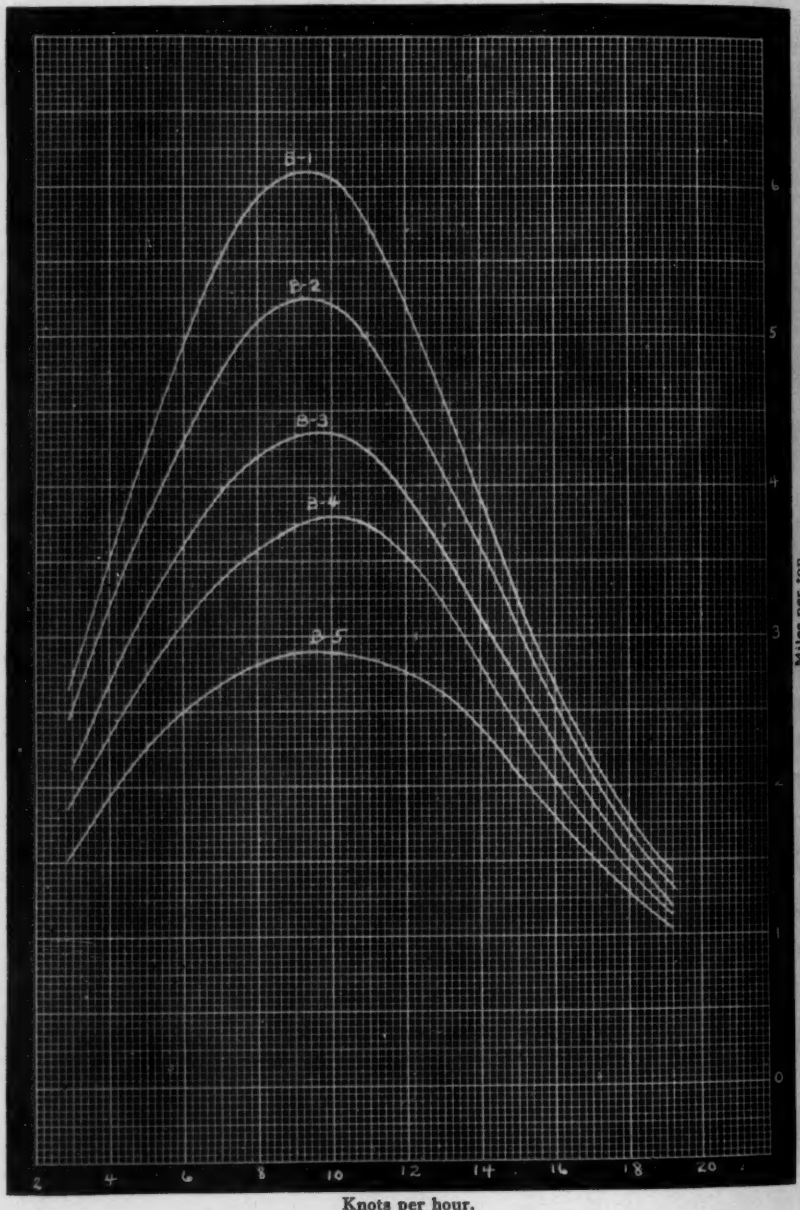
B-1
B-2
B-3
B-4
B-5
2
4
6
8
10
12
14
16
18
20
Knots per hour.
Miles per ton.
0
1
2
3
4
5
6

FIG. 4.

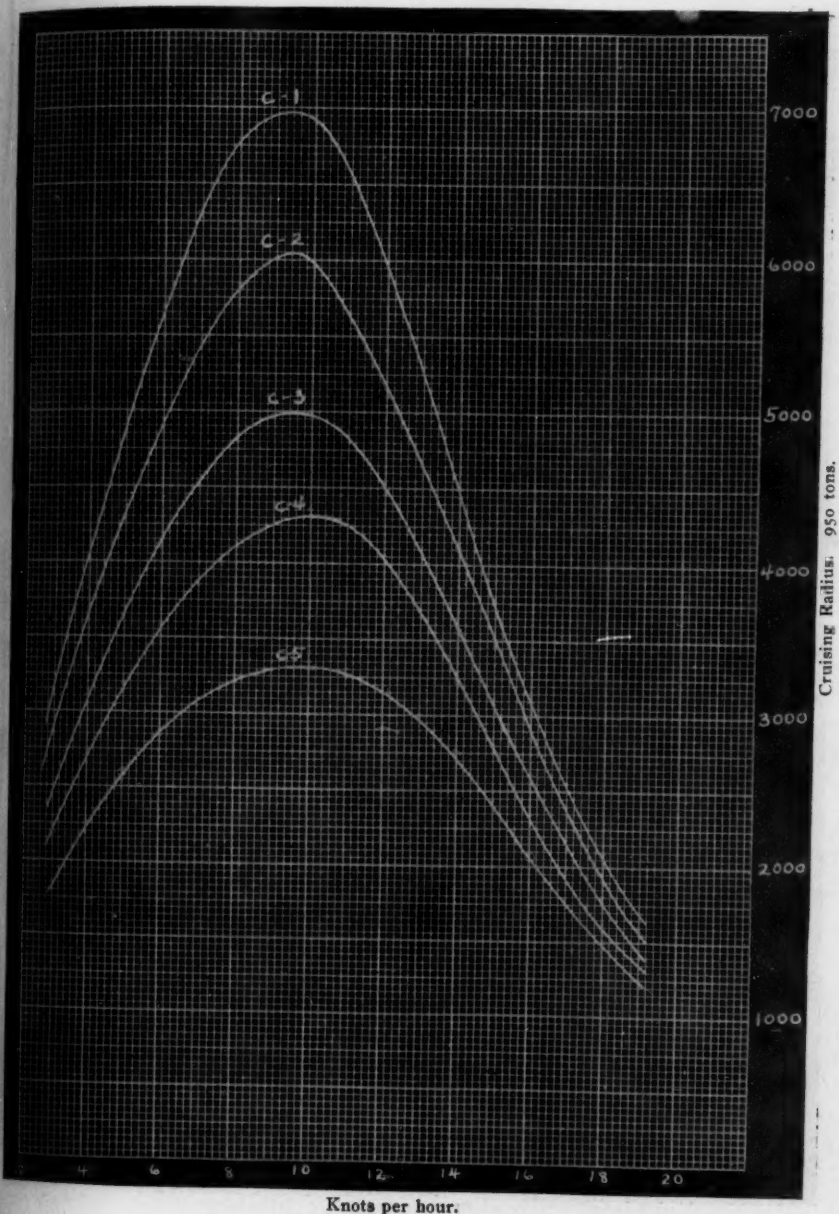
C-1
C-2
C-3
C-4
C-5
7000
6000
5000
4000
3000
2000
1000
Cruising Radius: 950 tons.
4
6
8
10
12
14
16
18
20
Knots per hour.

FIG. 5.

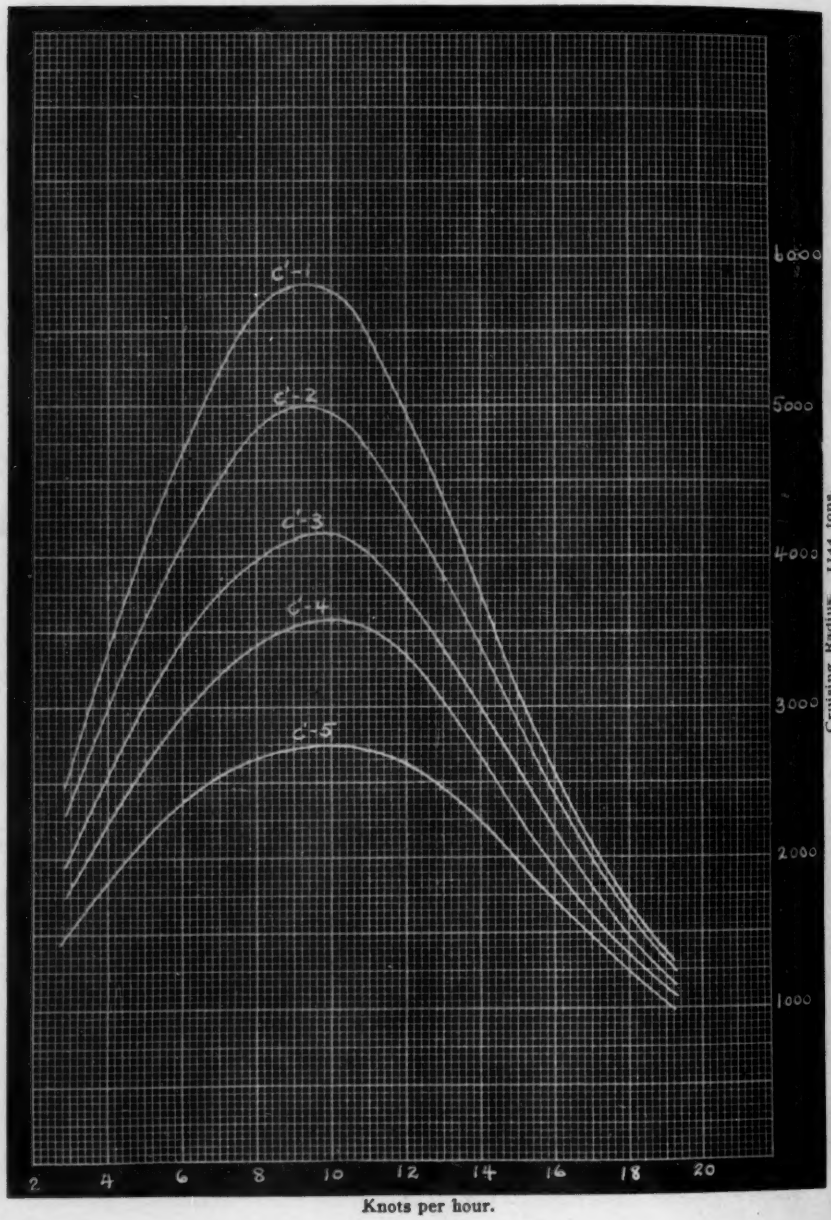
C-1
C-2
C-3
C-4
C-5
6000
5000
4000
3000
2000
1000
Cruising Radius. 1244 tons.
2
4
6
8
10
12
14
16
18
20
Knots per hour.

FIG. 6.

To illustrate: In the first problem, where the vessel has to make a voyage of 1650 miles on 500 tons of coal (or 3.3 miles per ton of coal), the commanding officer would be justified in selecting the curve of "miles per ton" corresponding to the latest performance of the vessel. Suppose during the last trip the vessel, steaming at 13 knots, made 4.1 miles per ton. The commanding officer, before sailing, would enter the "miles per ton" curve, Fig. 4, from 13 knots on the "knots per hour" scale, a vertical from which intersects a horizontal from 4.1 on the "miles per ton" scale on curve *B-2*. Therefore curve *B-2* would be used. So entering from 3.3 on the "miles per ton" scale a horizontal cuts curve *B-2* at 14.6 knots and at 4.2 knots, between which speeds he can make the trip without using more than 500 tons of coal.

Suppose he chooses 14 knots and after a day's steaming finds that he has made 3.5 miles per ton. Entering from 14 on the "knots per hour" scale, a vertical intersects a horizontal from 3.5 on the "miles per ton" scale just below the curve *B-2*, so he can predict his future steaming performance as lying along an imaginary curve just below *B-2*.

In the second illustration he has a voyage of 2000 miles to make without drawing on his reserve. Suppose that, as before, his most recent performance falls on curve *B-2*. He would in this case use curve *C-2* which corresponds to *B-2*, *C'-2*, etc. Entering from 2000 on the "cruising radius" scale a horizontal cuts curve *C'-2* at 17 knots which is the maximum speed he may use. After the first day's steaming he can recalculate, and should his data fall off curve *C'-2* he can use the curve on which it falls or interpolate between the two curves between which it falls. The other illustrations, and various problems that arise, can be handled in the same manner.

The original curve sheet was made for practical use aboard ship and with no idea of publication. It was found to be very desirable for use by the commanding officer, and the original description was accordingly written. Commander Kalbfus in reviewing the article suggested that it be expanded along the lines indicated. It is believed that a use of the curves in either the simple form of the average performance, or as expanded into five separate standards, will be found very useful and convenient.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Prize Essays 1918

The Board of Control announces the following awards in the Prize Essay Contest 1918:

Prize Essay awarded to Lieutenant Holloway H. Frost, U. S. Navy. Subject, "Letters on Naval Tactics." Motto: "Indoctrination makes effective coordination possible. Effective coordination makes concentration possible. Effective concentration, combined with the spirit of the offensive, makes victory probable." VOGELGESANG.

First Honorable Mention awarded to Commander H. O. Rittenhouse, U. S. Navy, Retired. Subject, "The Preparedness of the Future." Motto: "When a strong man armed keepeth his palace, his goods are in peace."

Second Honorable Mention awarded to Rear Admiral Bradley A. Fiske, U. S. Navy. Subject, "Naval Strategy." Motto: "First estimate the situation: then decide: then act."

The Prize Essay will be published in the April number of the PROCEEDINGS, if returned in time by the censor.

Articles for Publication

It is requested that all members take a more active interest in the writing and submitting of articles for publication in the PROCEEDINGS in order that the monthly publication may be continued and the usual standard maintained.

Dues

It is requested that members who have not paid their 1918 dues of $2.50, do so at their earliest convenience.

Address of Members

Because of the fact that many copies of the PROCEEDINGS are being returned by the Postal Authorities, *all members are urged to keep the Secretary and Treasurer informed of the address to which* PROCEEDINGS *are to be sent, and thus insure their receipt.*

This precaution is now of particular importance as notices of changes of stations are not now available for the use of the Institute's staff.

Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 10th of each month.

Membership Since December, 175 regular members have joined the Institute.

Deaths:

Captain Daniel Delehanty, U. S. N.
Captain R. K. Crank, U. S. N.
Lieutenant (J. G.) S. F. Kalk, U. S. N.
Ensign E. D. Peck, U. S. N.

Resignations: One.

Book Announcements Attention is invited to the List of Book Publications for a complete catalogue of books revised and republished by the INSTITUTE.

The Landing Force Manual, U. S. Navy, 1917, is being compiled by a board of officers and will be ready for distribution shortly after the compilation has been completed, probably April 15, 1918.

The Manual of Wireless Telegraphy has been revised and is ready for distribution under the title "Robison's Manual of Radio Telegraphy and Telephony."

Navigation and Compass Deviations, by Lieut. Commander W. C. Muir has been revised and is ready for distribution.

Discount on Books The five per cent additional discount allowed to purchasers of books whose accounts during a calendar month amounted to a hundred dollars or over has been discontinued.

Book Department The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

Suggestions Invited

Comment and suggestions relative to the make-up of the PROCEEDINGS are invited from all members interested in the welfare of the Institute. It is believed that the scope of usefulness of the PROCEEDINGS to members can be increased and all members are invited to assist in this work. Should any topic, on which you think an article could well be written, occur to you, send it to the Secretary and Treasurer, together with such explanation or comment as may appear desirable in order that the intent of the suggestion may be clearly understood.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Illustrations

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Notice

Whole Nos. 145, 146, 147, 149, 155 and 166 of the PROCEEDINGS (March, 1913, June, 1913, September, 1913, January-February, 1914, January-February, 1915, and November-December, 1916) are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

ANNAPOLIS, MD., February 22, 1918.

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ADMIRAL BENSON CHATS WITH COMMANDER-IN-CHIEF OF BRITISH GRAND FLEET ON FLAGSHIP.

Photo from Underwood & Underwood, N. Y.
Admiral Benson Chats with Commander-in-Chief of British Grand Fleet on Flagship.
Copyright Committee on Public Information.

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT W. B. JUPP, U. S. Navy

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BRAZIL

U. S. NAVY TEACHERS FOR BRAZILIAN NAVY.—Secretary Daniels announces that a commission of American naval officers will go to Brazil as instructors in the Brazilian school for naval cadets.

In sending these officers the United States is carrying out a recent promise to Brazil to assist in that country's war preparations.—*Official Bulletin*, 28/1.

BRAZIL WOULD AID AIR AND SEA FIGHT.—Commenting on notes exchanged between the Brazilian Foreign Minister, Nilo Pecanha, and the British Minister, Arthur Peel, on the subject of Brazil's naval contribution to the war, the *Jornal do Commercio* lays stress on the firm determination of Brazil to act, on the one hand, by means of aviators sent to England, and, on the other, by cruiser and destroyer squadrons.—*N. Y. Herald*, 31/1.

BRAZIL BUILDING AN ARMY.—Plans for the moblization of an army of defence to be composed of several hundred thousand men are being put into execution with almost feverish haste, but no announcement has been made that Brazil will send troops to Europe. It is generally believed that this fighting force is to remain in Brazil.

When Brazil declared a state of war to exist with the German Empire the Brazilian Army was composed of 18,000 men, with officers enough for 30,000. Plans were made immediately for increasing the standing army to 35,000 men by January 1, with the possibility of further increasing it to 100,000 within the year.

The mobilization plan provides for three lines of defence, the first eventually to comprise 100,000 between 17 and 30. To assure this number, it is said in official circles that conscription will take the place of the voluntary system of enlistment, which has been in effect until now.

The second line is to consist of an army of 500,000 men between 30 and 37, with detachments in every city and town in the republic. These men are to be mobilized on a war footing, ready for service at short notice, though it is not believed that they will be kept under arms, the plan apparently being to organize them as a home guard and permit them to attend to their business affairs, devoting stated periods of time to drill.

In addition to these two armies there is to be a reserve army, to be known as the national guard, comprising men between 37 and 44. The officers of this force are to be chosen from government administrative officers, commercial men, and employers of industry.—*N. Y. Times*, 21/1.

FRANCE

FRANCE TO TAKE MERCHANT SHIPS.—*Requisition of Entire Fleet is Decreed as Effective on March 10.*—A decree published in the *Journal Officiel* provides for the requisitioning of the entire merchant marine of France on March 10.

Government commissioners will confer with the shipowners as to the conditions under which the government will take over the vessels.—*Washington Post*, 17/2.

GERMANY

SUBMARINE BUILDING.—To arrive at a fair or accurate estimate of the rate at which Germany can build submarines in the future is difficult. Assuming, however, that all yards in the country were utilized exclusively for this kind of work and that no mercantile shipbuilding or repairs to the battle fleet were undertaken, which, of course, is far from being the case, the probability is that not more than 100 submarines could be completed every six months.

Information at hand would indicate that the actual recent output has been approximately 10 per month, of which the great majority are in the neighborhood of 800 tons to 1000 tons displacement. Several groups of about 1500 tons have also been commissioned and quite recently the construction of a flotilla of eight so-called submarine cruisers of 2800 tons displacement has been undertaken, of which three or more are reported completed and the remainder will be ready for service by next February. These vessels will mount two 6-inch guns, besides two guns of lighter caliber, and embody the innovation of an armored conning-tower. This is more or less essential where the conning-tower constitutes the central control station of the vessel and at the same time is the most vulnerable part. It is only feasible, however, on vessels of great size, because of submerged stability considerations.—*Navy and Merchant Marine*, January.

GERMANS TO BUILD 5000 PLANES.—Germany will have on the front some 5000 modern type war aeroplanes, with sufficient machines being constructed monthly by the various manufacturers to nearly replace those lost in battle and by accidents.

By offering special inducements to men entering the aviation service, great numbers of volunteer pilots, observers and bombarders have been secured, and are now under training in adequately equipped training camps.

It is realized by the allied aviators that 1918 will see stiffer fighting in the air than was deemed possible even a few months ago. The aerial forces of the United States cannot be whipped into shape too rapidly if they are to participate in the coming decisive struggles for the mastery of the skies.

The number of Prussian, Saxon, Bavarian and Wurtemburg escadrilles at present on a war footing and at the front is 270, classed as follows:

Bombardment escadrilles (Kampfstaffeln), 23; chasing escadrilles (Jagdstaffeln), 40; protection escadrilles (Schutzstaffeln), 30; campaign escadrilles (Fliegerabteilungen), 80; artillery observation escadrilles (Fliegerabteilungen A), 100.

The total number of aeroplanes represented by these 270 escadrilles is about 2500. The bombarding and chasing escadrilles are being increased

in number and strength rapidly, as the German aviation authorities consider them the most effective instruments of aerial warfare.

To the above formations must be added: The naval aviation groups, which include land escadrilles (Landfliegerabteilungen) and sea escadrilles, of an uncertain number; the fixed escadrilles (Kampfeinsitzerstaffeln), perhaps 10 in number, and some 12 depot escadrilles (Fliergerersatzabteilungen), which serve for the training of pilots and as a reserve for the escadrilles at the front.

The German aviation parks comprise:

With each army an army aviation park, including a depot for materials and machines; workshops and repair rooms and a reserve of personnel for the different escadrilles. In addition there are a certain number of special and emergency parks.—*Evening Star*, 30/1.

TORPEDO SHORTAGE RESTRICTS U-BOATS.—Shortage of torpedoes is one of the most serious facts with which the directors of the German U-boat war are now faced. It is a well known and admitted fact that German factories are at present absolutely unable to turn out first-class torpedoes in anywhere near sufficient quantities for the needs of the submarines. In fact, the underwater craft are being turned out faster than the torpedoes, with the result that recourse has been had to various expedients to keep the submarines supplied with their chief weapon.

Germany's fleet of U-boats must carry thousands of torpedoes. Thousands more must always be ready in reserve. In fact, the reserve supply should be larger to-day than a year ago, to allow for the more frequent calls made on it. The augmented destroyer patrol is responsible for this. They have made the submarines use up more torpedoes and have caused them to return to their base more frequently for reloading.

Eight may be said to be the average number of torpedoes carried in one submarine. The number ranges from four to twelve, according to the type of submarine. The *U-53*, which raided shipping off the Atlantic Coast of the United States, carried 10. More recent types load as many as 12. Mine layers can accommodate two, four, or six, depending on their size.

In connection with this shortage is the fact that all U-boat commanders now are strictly "rationed" as far as their supply of torpedoes is concerned, and are not permitted to waste torpedoes on long "chance shots" except in circumstances which they must explain in detail as justifying the expenditure of the underwater missiles.

Recently the German factories have been turning out a smaller torpedo which is less accurately tested but which may be used with a fair degree of certainty at close range. Of late very few German torpedoes have proved effective unless at fairly close range, and it has become unusual for a U-boat commander to make any attempt at a merchant ship unless he can get within 500 to 600 yards.

The Germans are now using two types of torpedoes. They may be described as short-charge and full-charge torpedoes. The short-charge is the one used mostly against merchant shipping and is fired at 500 to 600 yards. The full-charge, which has probably twice the destructive force and is better made, is reserved for men-of-war. It is fired at a great distance and is used less frequently than the cheaper torpedo.

But the comparative immunity of the American destroyers from torpedo attack—despite the loss of the *Jacob Jones* and the slight disablement of the *Cassin*—is noteworthy in this connection. The Germans hate the American destroyers as one of their worst enemies in their most fertile field of war action, and there is scarcely an American destroyer but has had one or more German torpedoes fired at her, yet only twice have the torpedoes found their mark.

The Americans and the British, with whom they are cooperating so successfully in this game of hunting "tin fish," attribute their immunity to the mobility of the destroyer. The alertness of the American naval men, coupled with their well-known keenness for offensive tactics against the submarine, have been responsible for their slight losses. Sharp lookouts

and skillful maneuvering enable them to cheat the Germans so often.—*N. Y. Herald*, 3/2.

EXPLOSION AT MUNITION FACTORIES.—Reports of explosions in Germany are becoming increasingly numerous, notwithstanding all the efforts of the German authorities to suppress them. A Karlsruhe telegram to the *Frankfurter Zeitung* states that a few days ago an explosion occurred at certain munition factories, presumably caused through improper manipulation of the ammunition. A fire followed the explosion, and three persons were killed and five injured. The damage, says the telegram, was relatively slight. Experience shows that these notices are never inserted in the German press unless absolutely necessary in order to reassure the public. Slight explosions are left unrecorded.

The Mannheim *Volksstimme* reported a serious explosion in munition factories at Kirchbaum, near Forbach, followed by an extensive fire, and the death or injury of many people. Apparently this explosion and fire are identical with those reported from Karlsruhe as very slight.

These repeated explosions are causing considerable anxiety in military quarters, not only because of the interference with the supply of munitions thereby occasioned, but also because of the spirit of unrest in the districts where they occur. This unrest has been acute since the advent of the frost, with the attendant suffering and the paralysis of potato transport.

The air raid reprisals undertaken by the Allies are, I have good reason to know, having a most salutary effect in awakening the population to a sense of the consequences produced by the Germans' ruthless air raid policy. Only by this means can the German home population be brought to realize their rulers' mistakes. Every Entente air raid is a most valuable educational influence in this direction. Great nervousness is felt throughout Germany, especially in the more exposed parts, by the intention of the Americans to invade Germany by air. This subject is universally discussed, though efforts are being made to calm the uneasiness by declarations about American bluff.—*London Times*, 31/12.

GREAT BRITAIN

THE FIRST SEA LORD.—By Arthur Pollen.—When I returned to England at the end of last week, after having spent nearly six months in the United States, I learned that Admiral Sir John Jellicoe had left the Admiralty to receive a peerage, and that Sir Rosslyn Wemyss had been appointed First Sea Lord. These events constitute what the *Daily Telegraph* quite accurately described as a "sensational" announcement. But judging from such public comments as I have had the opportunity of perusing, a great variety of sensations seems to have been excited. A good many people are plainly at a loss to understand the significance of what has occurred.

Sir Rosslyn Wemyss, save for his appointment as Second Sea Lord six months ago, and his more recent promotion to acting as Sir John Jellicoe's deputy, appears to be almost unknown to the press or to the general public. This may account for a certain lack of enthusiasm in the reception of the news of his promotion. Similarly the causes which made a drastic change in the higher command necessary, seem also to have been very little understood. One paper of very wide circulation, I noted, published a portrait of the outgoing First Sea Lord, and printed underneath it and in italics a statement to the effect that this particular journal had "never joined in the anti-Jellicoe campaign." When people see no reason why a change should be made, and then hear that an officer entirely unknown to them has been entrusted with the most difficult and the most arduous post in the anti-German Alliance, they are not unnaturally filled with misgivings and suspect that the late holder of the post is the victim either of some personal intrigue or of a cowardly submission to press clamor, and so look upon his successor as a *pis-aller*—a choice where there is no choice. The facts of the position are diametrically opposite to what such people suppose.

My readers may remember that some time before Mr. Balfour reconstituted his board, about 13 months ago, I pointed out in these columns that such a reconstitution was necessary, that the task of selection was extremely difficult, and that it was exceedingly unlikely, so obscure were the indications of competence in this grave matter—that Mr. Balfour could rest satisfied with his first, or even with second choice of advisers. I said this because the first choice was already known to him. To those who shared my doubts of a year ago, and have noted what has occurred between their expression and the present date, will have been more surprised that the second choice has been so long a-coming than that it has at last been made. It is unnecessary then to explain to them, as it would be ungracious now to explain to others, precisely why the first of the events of last week was inevitable. It is unfortunate that these transitions cannot occur without inflicting pain. The British public is extraordinarily loyal to its favorites, and particularly to its naval favorites. A large section of the public, which for years before the war had taken real trouble to study naval affairs, was led to believe that the greatness of the British Navy derived solely from the seamanship and statesmanship of Sir John Fisher, and depended on the leadership of his chief pupil and successor. It was shocked when events at Gallipoli led to Lord Fisher's retirement. It is shocked now when the gallant and popular officer, who had the full confidence of the nation in his command of the grand fleet, has to make way for another. This mental distress is deeply to be regretted, but it cannot be avoided. Old estimates of personal worth and ability formed in times of peace are constantly upset by the rude realities of war, without those who have formed those estimates being able to realize exactly how the upset has occurred. For the moment it is best to leave this mystery unexplained. It is more to the purpose to set out why the "second choice" is a sound choice. It may be some consolation to such people to know that the officer who is now First Sea Lord is where he is because it is war, and nothing else, that has shown him to be what he is.

If, therefore, I am asked what the recent changes in the Board of Admiralty signify, my simplest answer is, to say that at last we have an officer appointed First Sea Lord, not because of his seniority in the navy list, nor because he is blessed—or cursed—with a newspaper or popular reputation, but simply on merit shown in war. I was in Washington when Sir Edward Carson joined the War Cabinet, and an enterprising interviewer asked me why the Premier had put an ex-railway manager, presumably ignorant of the sea affair, at the head of the British Navy. I replied that he had done so for the almost incredible, but nevertheless valid reason, that Sir Eric Geddes had shown himself to be the right man for the place. Just as Mr. Lloyd George passed over all the popular politicians and chose the ablest man he knew for the most difficult position that a civilian can fill, so now Sir Eric himself has passed over all the advertised admirals and appointed the proved man for the most difficult post a naval officer can fill. It is natural to ask in what the proof consists.

In the early stages of the war the evidence of Sir Rosslyn Wemyss' merits must either have been slender or was unperceived, for when Sir Sackville Carden fell ill, a day or two before the last and most disastrous attempt to force the Dardanelles, Rear Admiral de Robeck was appointed to succeed him, and two officers senior to him were passed over by this preferment. Sir Rosslyn Wemyss was one of these. It is not an agreeable position for a rear admiral to find himself suddenly and unexpectedly subordinate to his junior. But it is in the day's work to accept these things with simple loyalty, and it would be no compliment to the present First Sea Lord to select that for congratulation which every naval officer must look upon as the most obvious and elementary of his duties. The fact is recalled to show that in March, 1915, Whitehall did not yet know their man, and likely enough because he had not yet been given his opportunity. But it was not long in coming now. It is known that on him devolved the chief share in the naval part of the two evacuations of the peninsular, and that

the naval part was the chief part. But his work at the bases previous to this and his subsequent work when he succeeded Sir John de Robeck in command of the Mediterranean, seem hardly to be known at all.

The abandonment of the Gallipoli adventure coincided, it may be remembered, with the beginning of the enemy's submarine activities on a large scale in the middle seas. The Mediterranean command was not limited to the Mediterranean, and it included the care of at least three lines of communications to different large army bases, and necessarily involved the closest co-operation with the French and Italian fleets. Few, if any, naval officers, therefore, have ever undertaken duties more difficult, more extensive and various, or more complicated than those which now fell upon the new C.-in-C. I see it has been stated, on the strength of his having commanded the vessel in which the King once visited his Eastern Dominions, that Sir Rosslyn Wemyss enjoys a reputation as a courtier. This is about as illuminating a remark as to say that because he wears a monocle he has a reputation as a dandy. But it is true that Admiral Wemyss is, in the best sense of that much hackneyed term, a man of the world. It was this fortunate circumstance combined with a perfect acquaintance with the French language that smoothed his diplomatic path with our gallant naval allies. He illustrated in short, but in an unexpected sense, the dictum of Nelson, that the best of all negotiators was a British admiral backed by a British fleet. The Paris Conference decided, I understand, and the decision was in every sense gratifying, that an Allied Naval Council was to be established. In acting with such a council Sir Rosslyn Wemyss has his Mediterranean experience to guide him. He has to welcome a new ally, the United States, as an addition to those with whom he has dealt before. It is surely a happy augury that these complex relations will be handled at the British end by one whose knowledge of the world, whose tact and diplomatic accomplishment are unquestionable.

However, the essence of the Chief Command to-day is to get, first, out of the British naval force and then out of our allies, the maximum dynamic effort against the enemy's effort to cut our sea communications. As most competent observers have long since realized, the defeat of the submarine is far less a matter either of new inventions or of mere multiplication of known weapons or weapon-bearing units than a matter of the best combination of forces already in existence. This combination can only result from a rightly organized staff. What ground is there for supposing that Sir Rosslyn Wemyss will do better than his predecessors in this matter? They are of the most solid possible description. They are, in point of fact, just these, that when faced with those extensive, varied, complicated and difficult tasks to which I have alluded above, Admiral Wemyss was able to deal with them, and deal with them successfully, precisely because, knowing exactly what he wished to do and being resolute to get it done, he also knew how to organize the men at his disposal, so that each separate task was clearly defined and plainly feasible. He profited, in other words, by the grinding experience of Gallipoli, and realized that only by a rightly constituted staff could the manifold work of war be properly done. The scale of this achievement was naturally enough known to few. But, by July of last year, the evidences of it were available at Whitehall, and Sir Eric Geddes had not long been there before he had appreciated their meaning. It will be remembered that it was almost his first act to bring Sir Rosslyn Wemyss into his councils. The change was announced in America in the second week in August. I may, perhaps, be pardoned for quoting from an interview with me in a Washington journal on the occasion.

"The really big stroke is the retirement of Sir Cecil Burney and his replacement by Rear Admiral Rosslyn Wemyss. I have not a British Navy list by me, but, at a rough guess, I should say there are probably 40 officers senior to Admiral Wemyss who have been passed over to permit this officer to take this position. Wemyss has long been regarded by the forward school as a 'white hope.' He was second in command during the Gallipoli

campaign, where his promptness, energy and fighting spirit showed him not only a real leader, but a man possessed of that cool, quick judgment which is of the essence of the matter in war.

"The cables say the new Second Sea Lord is to be relieved of certain departmental duties, but do not tell us what the new duties are to be . . . . But is it not difficult to guess the character of the change. The rearrangement of two months ago brought about an amalgamation between the War Staff and the Board of Admiralty. The First Sea Lord was still left as the chief administrative head of the whole active navy and of the staff as well. I expect what will happen is that the First Sea Lord's functions will now be cut in half, that he will remain the chief professional administrator and the Second Sea Lord will become the chief of the War Staff. It will represent the triumph of the younger school. When the great changes took place in May, those of us who had fought so hard for them for so long approved everything that had been done, but complained that the thing had stopped too soon. We also saw that the thing could not remain stopped where it was. It had to be pushed to its logical conclusion. . . . . It looks as if Sir Eric Geddes had found an extremely ingenious and perfectly effective way out of the difficulty. If the appointment of Admiral Wemyss means what I hope it means, we may expect to see the vast potential power of the British Navy applied to winning the war in a fashion which has not yet been applied."

It looks as if I did not very greatly misjudge the situation in August. What would seem to have happened is something like this. Sir Rosslyn Wemyss was tried at the Admiralty in the task of which he had shown himself to be a master in the Mediterranean. It was a task that had not been successfully met elsewhere, because it had never been attempted elsewhere. If he made good with the same success at Whitehall there would be no need for a deputy First Sea Lord, but a clear case for making him First Sea Lord. In the event Admiral Wemyss did make good.

Significance of Sea Power.—Surely the New Year could hardly open under happier auspices. The developments of the last few months have changed the position on land to the enemy's advantage in a most disconcerting and discouraging way. But as no one knows better than the enemy himself, it is at sea, and not on land that the war will finally be decided. The factors, that is to say, on which victory depends, are still those that derive from sea power. How well the enemy understood this a year ago was proved by his being compelled to drive the United States into belligerency rather than forego his only possible stroke at the sea supplies that kept the military alliance against him in munitions and stores, and the civil populations, on whose well being and contentment all military force is founded, supplied with the necessaries of living and prosperity. A year ago, when the enemy's efforts to make peace after his many defeats on the Somme had failed, when President Wilson's last effort at an amicable arrangement had shown all the world that no settlement by negotiations was possible, it became at once clear that a ruthless submarine attack on our supply ships would immediately be made. Those who remembered the terms of the German surrender to America of the previous May expected nothing else. For, with curious and quite unnecessary candor, Berlin, for once, instead of making a promise and breaking it, entered into an undertaking that was purely provisional and warned the world that the objectionable sinkings would be resumed the moment it suited Germany's convenience or necessity. In other words, from the day when Von Tirpitz first threatened the world with the submarine, in December, 1914, until she drove America into war in February, 1917, Germany was never under the faintest illusion about the sea war being the real war.

It is a vital matter that civilians in all countries should bear this fundamental truth in mind, especially at the moment when the disappearance of Russia has altered the whole balance of power on land. For the disappearance of Russia and the change in the military situation that results, do not in the least degree affect the validity of the axiom on which our

enemy has acted consistently and from the first. For the military change amounts only to this, that until the American army redresses the balance on land, the allied forces are possibly insufficient to obtain a definite military victory. But, meanwhile, the enemy forces are still less able to obtain a decision in their favor. The change in balance, then, restores a situation gravely weighted against the Central Powers to equality only. And it is, at best, temporary.

The problem of the day, then, is civil endurance; how shall we hold out till the enemy force is spent? It is largely a matter of confidence—of the certainty of ultimate and complete success. This confidence—if I am right in saying that ultimate success turns on the sea war—should now be better founded than it has ever been, for the reason that never before have we had a better assurance that a sea power would be rightly used. The reform of the Admiralty, initiated by the criticisms of last April and May, begun by Mr. Lloyd George in the end of the latter month, and now completed by Sir Eric Geddes, should form the turning point in the war.—*Land & Water*, 3/1.

JAPAN

JAPAN RESPONSIBLE FOR KEEPING PEACE IN EAST.—"Japan holds herself responsible for the maintenance of peace in this part of the world, and consequently in the event of that peace being endangered to the inevitable detriment of our interests, the government of Japan will not hesitate a moment to take the proper measures."

Thus Count Terauchi, the Japanese premier, spoke at the opening of the diet in referring to the internal disorders in Russia spreading to the Russian possessions in eastern Asia. The premier declared that the situation in Russia was causing him the greatest measure of anxiety. "As the true friend of Russia," he said, "Japan earnestly hopes that country may successfully settle its difficulties without much further loss of time and establish a stable government."

Count Terauchi said also that Japan joined unreservedly with the allied powers in the determination not to sheathe the sword until an honorable peace is secured.—*N. Y. Herald*, 24/1.

SPAIN

STOPPAGE OF SPANISH SHIPS.—The holding up of the sailings of Spanish liners this week and the stoppage of export licenses covering shipments to Spain came not unexpectedly, because it had been suspected for a long time in well-informed shipping circles that cordial relations with the kingdom could not consistently be maintained in view of certain conditions of which no secret was made before America entered the war, but which have since assumed a different aspect in so far, at any rate, as the attitude of this country is concerned. To the credit of Spain, it is to be said that the personal efforts of King Alfonso on behalf of a multitude of war prisoners and families dispersed as a result of invasion by armed forces, have endeared him to hundreds of thousands of people throughout the civilized world. But in a constitutional monarchy, such as Spain is supposed to be, the acts of the sovereign, meritorious or otherwise, have but little bearing upon the external relations of the country, and the acts of Spanish statesmen during the war have been responsible for the suspicion with which Spain is now regarded by the Allies. This suspicion is based partly upon positive, and partly upon negative, evidence. The positive evidence against Spain is based upon the fact that the peninsular has been for some two years the headquarters of the German propaganda in Europe and that the tons of pamphlets which have been distributed throughout Latin-America for the purpose of extolling the acts of the Huns in war, were written and printed in Spain and shipped thenceforth. Furthermore, Spain has taken very little trouble to prevent imports certified for local consumption to leave the kingdom, and before the system of licenses was inaugurated in this country the crews of Spanish ships were in the habit of purchasing huge quantities of fittings and engineer stores which could have been used

for no other purpose than that of supplying submarines. The recent escape of a U-boat that was supposed to have been interned in a Spanish harbor is still too recent an episode to warrant repetition and there is in the possession of the Allies conclusive evidence that some of the Spanish ships regularly engaged in transatlantic service supplied U-boats in Spanish territorial waters.—*Shipping*, 2/2.

SPAIN PROTESTS SINKING.—*King Alfonso Presides Over Cabinet as Reparation for the "Giralda" is Asked of Germany.*—The cabinet met yesterday under the presidency of King Alfonso and decided to send a strong protest to Germany, demanding reparation to Spain for the sinking of the steamship *Giralda*. The note will not be sent through Prince von Ratibor, the German ambassador, but will be telegraphed to the Spanish ambassador in Berlin.

The Spanish steamer *Giralda* was sunk by a German submarine January 26 after the crew of the U-boat had pillaged the vessel. The crew of the *Giralda*, which measured 4400 tons was saved.—*Washington Evening Star*, 1/2.

UNITED STATES

KEEL IS LAID IN RECORD TIME FOR FIRST FORD PATROL BOAT.—Secretary Daniels announces that he has received a telegram from Henry Ford, of Detroit, stating that the keel for the first of the new type patrol boats to be built in the Ford plant was laid February 6, and the side frames are ready to go up. The Secretary authorizes the following statement regarding this new type:

"The contract for these boats was given on January 17, so the keel was laid in 20 days after the contract was made.

"Mr. Ford's letter offering to build naval vessels in his plant was dated December 22, 1917. In a few hours after it was received, December 24, a telegram was sent, asking Mr. Ford to come to Washington to discuss the matter. Mr. Ford and his staff arrived in Washington December 27 at 6 p. m. The next day was spent in consultation with Rear Admiral Taylor, Chief of the Bureau of Construction and Repair, Rear Admiral Griffin, Chief of the Bureau of Steam Engineering, and other officers of the two bureaus. The Ford party then went to Philadelphia and other localities to look at shipyards and plants. They returned to Washington on December 31 for further consultation, and were given the preliminary plans and specifications of the boats to be built.

"The party returned to Detroit, and on January 8 the Navy Department wrote Mr. Ford that it was ready to hear further from him. Four days later more complete plans were delivered to representatives of the Ford Company.

"Mr. Ford telegraphed his proposition to the Navy Department on January 15. On the 17th the department telegraphed the award to the Ford Company of the contract for building a large number of the boats.

"Preparations for construction were begun at once, Rear Admiral C. W. Dyson, representing the Bureau of Steam Engineering, and Naval Constructor Robert Stocker, representing the Bureau of Construction and Repair, going to Detroit to assist the builders in laying out their plans. On February 7 the keel of the first boat was laid.

"When it was decided to build this new type of patrol boat, which possesses many of the advantages of destroyers and is as large as those of the older type, the naval constructors and engineers worked day and night and Sunday to perfect the plans, and the design was perfected in 10 days. The work was done in the Division of Design, Bureau of Construction and Repair, under the direction of Naval Constructor Stocker, and in the Bureau of Steam Engineering under the direction of Rear Admiral Dyson. A model was made and tested in the testing basin at the Washington navy yard, and all the details were completed in record time.

"The Ford Company is pushing construction at a rate that bids fair to exceed all previous records in the building of steel naval vessels."—*Official Bulletin*, 9/2.

NAVY POWDER PLANT.—Plans have been completed by the Naval Bureau of Ordnance, under direction of Rear Admiral Ralph Earle, chief of that bureau, to increase the facilities of the smokeless powder factory at Indian Head, Md. It is estimated that the sum of $2,400,000 will be required for this purpose and Congress has been asked to appropriate that sum.

Under authority given by the President during the recess of Congress installation of additional facilities already is under way. The present capacity of the plant is 24,000 pounds of powder a day, which will be increased to 40,000 pounds by July 1 and 60,000 by November 1, with the hope of ultimate increase to 100,000 pounds.

The plant is in operation 24 hours a day and the annual aggregate output will be 18,000,000, which quantity was decided upon after conference between the naval authorities, the army officers, the war industries board and representatives of the French and British governments. The cost of production this year is less than ever before, due to improved methods and increased output per employé. The cost is about 40 cents per pound, or 13 cents less than the powder obtained under contract.—*Washington Post*, 17/2.

SHIPS BUILDING.—Nothing may be said at this time about the progress of construction of the powerful additions to our main fleet which were authorized before we entered the war. It includes five superdreadnoughts of 32,000 tons, mounting twelve 14-inch guns; four ships of 32,500 tons, carrying eight 16-inch, 45-caliber guns; and four superdreadnoughts the biggest yet planned for any navy, of over 40,000 tons, mounting twelve 16-inch, 50-caliber guns. In addition, the program includes six 35,000-ton, 35-knot battle-cruisers, and ten 7500-ton, 35-knot scouts.

We are much pleased to be able to state that the plans of the battle-cruisers have been recast so as to bring the whole of the boiler plant below the water-line. It has been found possible to do this, moreover, without adding to the length or displacement of the ships.

The expansion of the navy in general has been truly enormous. The total strength of the personnel, including the Marine Corps, on November 15, 1917, was 272,000 officers and men, and it is still growing. So far as material is concerned, the total number of vessels of all kinds has been trebled since the war began, the total number of ships now under construction being close upon 800, including every type from the submarine chaser to the superdreadnought. For the fuller details of the expansion of our navy reference is made to our liberty war number of December 1, 1917.—*Scientific American*, 5/1.

PLANS NEW BIG DRYDOCK.—*Present Naval Structure at Norfolk to be Finished in October.*—That the great drydock under construction at the Norfolk Navy Yard will be ready for occupancy before October, was the prediction to-day of Rear Admiral McLean, commandant of this naval district. The admiral also declared that plans are ready to begin work on an even larger one the moment the first is completed.

The admiral declared that the structural shops, depots, storehouses and other improvements would be completed ahead of schedules. The yard was being developed, he said, into the nation's greatest structural and industrial base, while Hampton Roads would be the navy's chief operating base. —*Washington Post*, 17/2.

INCREASE IN NUMBER OF ASSISTANT SECRETARIES OF THE NAVY.—Secretary Daniels and Assistant Secretary Roosevelt differ radically as to the need of two more assistant secretaries of the navy, as contemplated by proposed legislation, and members of the naval committees, as a result, are in a quandary as to what recommendations to make on the subject.

Mr. Daniels does not believe that additional assistant secretaries are necessary. When he was before the House Naval Committee, he explained that there is no limit on the power of the Secretary of the Navy to detail any officer, active or in the reserve, to any duty in Washington or at

any shore station. The greatly increased administrative labors have called for many more such details than would be required in ordinary times. Under the present laws, in the necessary absence of the secretary and assistant secretary, the chief of naval operations becomes acting secretary, so that on that score there is no necessity for an additional assistant.

He also stated that the administrative machine of the Navy Department is centralized and efficient, it has met the strain of war by natural and easy expanse, and, while such service as additional secretaries would relieve the secretary and assistant secretary of much arduous labor, he feels that the present system insures personal and centralized directions that might not be benefited by such division of responsibility as the creation of new offices might bring about.

A few days later, when Mr. Roosevelt appeared before the same committee, he argued with emphasis in favor of additional assistants, pointing out that one would be of value in connection with the bureau of supplies and accounts, another having to do with the personnel, and the first assistant secretary to be the "understudy" of the secretary. In this view, he was supported by Paymaster General Samuel McGowan.

Mr. Daniels also is opposed to a proposal, advanced at the Capitol, for the establishment of a new bureau in the Navy Department to look after target practice, the chief of the bureau, to be known as director of target practice, to have the rank of rear admiral. The secretary believes that the present organization is sufficient and efficient with the present office of director of target practice under the control of the chief of operations. —*Washington Post*, 17/2.

NEW POLICY FOR NAVY YARD ADMINISTRATION.—A new policy for separating the administration of navy yards from naval districts is announced by Secretary Daniels in orders directing changes in commanding personnel.

Rear Admiral Spencer S. Wood is designated to command the first naval district at Boston, relieving Captain William R. Rush, who remains as commandant of the Boston Navy Yard.

Rear Admiral John D. McDonald is assigned to command the New York navy yard, succeeding Rear Admiral Nathaniel R. Usher, who will continue as commandant of the third naval district at New York.

Rear Admiral James M. Helm is appointed commandant of the fourth naval district at Philadelphia, relieving Captain George Cooper, who will remain as chief of staff.

Rear Admiral Augustus F. Fechteler is ordered as commandant of the Norfolk navy yard, succeeding Rear Admiral Walter McLean, who will continue to command the fifth naval district at Norfolk.

"This division," said Secretary Daniels, "which is necessitated by the magnitude of the naval activities in the districts, has for its purpose the separation of the industrial feature of the district work, which will be handled by the navy yards, from the military and marine features, which will be administered by the district commanders."—*Washington Evening Star*, 1/2.

THE WAR CABINET.—Critics of the war activities of the United States in their anxiety to find grounds upon which to base complaints lose sight entirely of the fact that in everything this nation does there must be given full consideration at all times to the necessities and the plans of our allies. Inquirers ask impatiently, "Why is this done?" or "Why don't the War Department do this or that?" And without waiting for an answer or looking calmly into the facts they frequently make charges which might be serious if warranted. The fact that in the conduct of this great world war the United States is just one of a firm, one of the junior partners at the present time, when expenditures of men and munitions is considered, does not seem to have become impressed upon the minds of many American citizens. The acts of each of the partners, the allies, must of necessity be in accordance with some definite line of action, con-

structive or destructive, that has been determined upon as that which will draw nearer the day of victory.

It is not difficult to perceive that the most vital feature of these activities at present is the maintenance of the forces that are at the front, supplying them with food, clothing and munitions, and training troops to send to the front just as rapidly as they are ready to go into the field. Plans to accomplish each of these objects cannot be worked out by the United States alone and every movement that is made must be a part of the necessary plans for cooperation. The activities of the War and Navy Departments are controlled by this purpose. The results following this cooperation have led to some criticism, but it may be safely said that nothing has been neglected that the departments had it in their power to do. That the defeat of the shipping bill two years ago is largely responsible for the shortage of transport tonnage cannot be denied and that measure was defeated by a Congress made up to a large extent of men who in the present Congress furnish some of the most severe critics of the War and Navy Departments.

There is much in the proposed war cabinet bill that sounds like the Board of Strategy which was formed in 1898 and some of the men in Congress are discussing giving the proposed new body similar powers to those held by that historic board, which won the special attention of "Mr. Dooley." These solons lose sight of the fact that in 1898 the United States was engaged in a war in which it had no allies and it had no problem of supplying anything to any other nation. They forget that any plan must have the approval of a general conference of the heads of the allied nations. There is an inclination among the critics to lose sight of the fact that representatives of the United States have met the representatives of our allies in Paris and much of the future activity of the war has already been mapped out. Future plans will be further considered in Paris or in London or in Rome. And while we shall do our part in the planning, Washington, several thousands of miles away, must be to some extent the place for the reception of orders and distribution of contracts by which the plans can be carried to final success.—*Army and Navy Journal*, 26/1.

U. S. BATTLESHIPS.—[Extract from Assistant Secretary of the Navy's speech before Harvard students.] The British Navy has the same relative strength against the German as it had at the beginning of the war. Furthermore they have the active cooperation of French and American surface ships of heavy tonnage. We have, of course, many battleships on this coast that are little heard about.—*N. Y. Times*, 17/2.

COORDINATION IN SHIPPING ADOPTED.—Coordinated direction of naval and army shipping to an extent seemingly impossible a short month ago became a reality January 30. As a result the overseas transportation of troops, supplies and the like will be greatly expedited.

All this as a result of the success which has followed the creation within the Navy Department of the Naval Overseas Transportation Service, of which Commander Belknap is the director. The new service has demonstrated marked ability in getting its ships through the submarine danger zone, and as a result of this success its tonnage was practically doubled.

The War Department announced it would turn over to the Overseas Service upwards of 2,000,000 tons of shipping which heretofore has been operated exclusively under the direction of the Quartermaster's Department. Many of these vessels are manned by civilian crews and have been under civilian masters.

The Bureau of Navigation will henceforth supply crews from the Naval Reserve, and the command of these ships will go to naval men. To all intents and purposes the vessels will be naval craft, although still performing their work for the army. And the change will mean that their efficiency will be doubled right from the start.

It was because he knew that this change was impending that Secretary of War Baker was willing to let it be known to the Senate Military Affairs

Committee that the army in France was to be materially added to within a short time. With shipping coordinated and the army and navy cooperating through vessels manned by disciplined naval men, high efficiency in overseas transport is possible. Under the old rule, with alien crews and civilian commanders, this could not have been done.

The taking over of this great amount of shipping by the navy and the manning of ships with crews from the Naval Reserve forces is considered in shipping circles one of the greatest steps toward making the United States merchant marine the equal of any in the world after the war. It means the Americanizing of all United States shipping.

In the past all ships have been manned by crews made up of aliens as well as Americans, but to become a member of the Naval Reserve the first requisite is that a member must be a naturalized citizen of the United States.

It is pointed out by those in charge of the work of taking over this merchant fleet that the crews will be thoroughly trained and disciplined according to the high standards of the navy, and that when the war is over and the ships revert to their owners, they will be returned with a full complement of men who will be given their discharge from the Naval Reserve.

Further, it is planned by Rear Admiral Leigh Palmer, Chief of the Bureau of Navigation, that where ships in course of construction are turned over to the Navy Department for operation to organize the crew in advance and have the men thoroughly trained under their future officers and ready to man the vessel immediately upon it being placed in commission.—*Baltimore Star*, 30/1.

BIG BUILDING FOR NAVY.—The new structure to be built for the United States Navy Department on the Bush Terminal property in South Brooklyn will, it is said, be the largest business structure in the city of New York. It will be 700 by 1280 feet and eight stories in height. It will be of reinforced concrete and practically fireproof, and will cost $10,000,000. It will have a floor space of 7,168,000 square feet, or over 165 acres.

This building will be used for the storage of naval supplies and for the manufacturing, packing and shipping of goods for United States war vessels.—*Washington Evening Star*, 9/2.

NAVAL BASE AT CAPE MAY TO BE GREATLY EXTENDED.—The Hotel Cape May, which cost its builders $1,350,000 in 1909, and which is now practically owned by Nelson Z. Graves, of Philadelphia, and George E. Matthius, of Seymore, Conn., has been leased by the War Department for hospital purposes at an annual rental of $99,000. It has 600 rooms and is the handsomest hotel south of Atlantic City. The hotel is within two miles of the Henry Ford farm, on which is located the Wissahickon Barracks, where about 3000 Naval Reserve men are being trained, and within a mile of the Navy Department's aeronautic training station and the submarine protector base at Sewells Point.

General George W. Goethals has also ordered the State Road Commission to build a hard surface road from Keys Landing to Cape May, to have ready access to the War and Naval Department bases.

The Cape May barracks, which were built last summer, are now being doubled in capacity, so that by late spring there will be more than 10,000 men in training there.

Including the dredging of the entrance to the Cape May harbor, which embraces 500 acres, the government has expended already about $3,000,000 at Cape May, as it is the only landlocked harbor between Sandy Hook and Norfolk. The Surgeon General's Department has reported that the Cape May cantonment is one of the healthiest training places the government has established.—*Baltimore American*, 28/1.

FOR LARGE INCREASE IN NAVY.—*Plans for Extensive Enlargement of Existing Training Stations.*—In connection with Secretary Daniels' renewed recommendation for a large increase in both temporary and permanent enlisted personnel of the navy, it is stated that the department plans exten-

sive enlargement of several existing training stations. Plans already have been approved for enlarging the Pelham Bay, N. Y., and Norfolk, Va., stations. Five thousand men are now at Pelham Bay and 16,000 at Norfolk.

The navy has 95,000 men under instruction, and, with the recommended increase, will have men enough to supply crews not only for the entire naval construction program as now contemplated, but also for the hundreds of merchant ships which are to be placed under its supervision.—*Evening Star*, 1/2.

NAVAL CREWS FOR U. S. TRANSPORTS.—It is announced at Washington that an arrangement has been come to between the Navy Department and the Shipping Board whereby all vessels used for transporting men or supplies to the American forces in France will be under the command of naval officers, and have crews of naval reservists or regular enlisted men. Up to the present, only the troop transports have been manned on this system, the horse transport and supply ships chartered for the American forces being operated by the Quartermaster's Department of the War Department, which employed merchant crews. Owing to the shortage of men in the American mercantile marine, it was not always possible to obtain a full crew of competent hands for every chartered ship, and it sometimes happened that a fast steamer could not realize her normal speed while in the submarine area, owing to unskilful stoking. Moreover, there was a dearth of trained men for lookout duty in the war zone. The new arrangement is therefore expected to add very materially to the safety of the transports and supply ships on the Atlantic route, as all these vessels will be operated by officers and men with naval training and accustomed to the high service standard of efficiency and discipline. This step has been found practicable in consequence of the great expansion of the navy's personnel since the declaration of war, so many volunteers having enrolled that, after assigning full complements to all warships and auxiliaries, complete and building, there will be a large surplus available for duty in the transport service.—*The Engineer*, 18/1.

A compromise seems to have been reached between the Navy Department and the Shipping Board regarding the personnel of the new merchant marine that is coming into being. Unlike most compromises, the plan hit upon gives promise of accomplishment, to some degree; but, like all compromises, it fails of the object ultimately to be sought. Under the terms of announcement made on December 12 the Navy Department and the Shipping Board will exercise a joint jurisdiction as follows: "The bulk of vessels under the American flag, whether engaged in the transatlantic or elsewhere, so long as they retain their character as merchantmen, will continue to be manned by merchant sailors. Troopships and vessels carrying whole cargoes of munitions or supplies for the army and navy, however, for military reasons, will be manned by naval crews."—*Navy and Merchant Marine*, January.

NAVY PERSONNEL—A CAUTION.—In all plans for the irresistible extensions demanded in the commissioned and warranted personnel of the navy the conditions and the resultant reductions in the naval establishment that must be faced after peace is declared should be kept clearly in mind. When the navy was reorganized and slowly starved almost to death after the close of the Civil War gross injustices were inflicted on the regular officers and serious harm was done to the service simply because no forethought had been exhibited.

Although less than 60 volunteer officers were, as the result of examinations open to all these gallant men, taken over, this and the yearly demotions forced by Congress blocked promotions until despair settled on the service in all grades below commander. It was the rule, not the exception, in those sad days for graduates of Annapolis to be kept in the rank of ensign for 12 years or more and for lieutenants to be held kicking their heels

without any advancement for periods varying between 20 and 22 years. In the late 80's a lieutenant less than 40 years of age was a curiosity.

At the beginning of the "present emergency," as Congressional acts euphemize this state of war, a number of reserve officers were granted temporary commissions as lieutenant commanders and lieutenants, and this before their mettle could be tested. It is recognized that the sudden and tremendous extensions in the lists of officers had to be met, and, as a consequence, in the early days haste rather than complete wisdom settled the problem. Without attempting to abridge for one moment the value of the work already performed and promised by temporary officers, who in the main have responded to the "great call" from a sense of unquestionable patriotism, it is now time for prudence to enter. Various bills are before Congress and others must follow, but previous to their enactment such safeguards should be provided that the cruel experiences following the close of the Civil War, and for many succeeding years, shall not be repeated. —*N. Y. Herald*, 8/2.

RESERVE OFFICERS' CLASS.—Secretary of the Navy Daniels visited Annapolis for the purpose of addressing the members of the second reserve officers' class of the navy upon the occasion of their completion of their 15 weeks' intensive training in the more practical branches of the activities of a naval officer.

Requests for assignments to particular ships or particular types of duty have apparently carried little weight with the navy authorities. Eight of the men will be kept at the Academy as duty officers for the third class of reservists, members of which are to be sent to New London for a four or five months' course on submarines; 60 have been ordered to torpedo-boat destroyers, about half of whom will go across in the near future; 60 will go to cruisers, gunboats or transports, and 87 will go to the Atlantic fleet's various ships. The remaining 27 will be held at the Academy for the academic board's action on their work.

The work done by the young citizen officers has been highly satisfactory to the authorities. The average mark for the entire class for the three months' work was about 79.1 per cent.—*Baltimore American*, 29/1.

SENATOR TILLMAN WANTS 10,000 AVIATORS IN NAVY.—Senator Tillman, chairman of the Senate Naval Committee, to-day introduced a bill to increase the number of naval aviators from 350 to 10,000 and raise the enlisted personnel of the navy to 180,000.

The President would be authorized to appoint temporary officers not higher than the rank of lieutenant commander in the navy and major in the Marine Corps.—*N. Y. Herald*, 29/1.

ENROLLING UNDERGRADUATES IN THE NAVY.—Instructions have been issued by the Bureau of Navigation to the commandants of the several naval districts regarding the enrollment of undergraduate students of technical universities in the naval reserve force. In order to insure the future engineering men of the navy that bureau states that it desires the enrollment of such students in the reserve. Any undergraduate between 18 and 21 years of age, who is actually taking a technical course at a technical university and who is physically qualified, may be enrolled as a seaman, second class, in class four of the naval reserve force for general service. These students will not be called to active duty until they have graduated, except in case of great emergency, which emergency the bureau does not at present foresee. No promise of commission will be given these undergraduates; and when they are graduated and called to active service they will be examined and rerated according to their ability and the requirements of the service. While they are on the inactive list pursuing their studies they will be carried in the initial rating of seaman, second class. Enrolling and recruiting officers of the navy and naval reserve force have been instructed to get in touch with the technical universities.—*Army and Navy Register*, 9/2.

COAST GUARD PERSONNEL.—Temporary increased rank and pay for certain officers of the coast guard while operating as a part of the navy has been recommended by the Secretary of the Navy, and bills now are pending which contemplate such legislation.

It is proposed to put the coast guard officers on the same footing as officers of the navy. Most of those that would be benefited by the legislation now are on duty with the naval forces operating in foreign waters and they are performing hazardous duty of the same general nature as that performed by navy officers. It is believed that the coast guard officers not only are entitled to this recognition of their services, but also that the proposed legislation will facilitate command at sea, where there is bound to be contact between officers of the two services doing similar work.—*Washington Post*, 17/2.

TRAINING OF NAVAL RESERVISTS.—The next class of naval reservists to be trained at the officers' school at Annapolis will number 450, which is the limit of the accommodations there. The results of the previous training, when two classes have been graduated of about the same aggregate strength, have been most satisfactory. Reports received from Vice Admiral Sims are most complimentary in regard to the 50 men sent from the school trained for service with the destroyers. The candidates are confined to enlisted reservists, selected from the naval districts, and the competition is keen on account of the opportunities afforded for service and promotion. Many of the students are college men who entered the service for the war. Numerous inquiries have come in regard to the instruction from the *U. S. S. Harvard*, which is in the war zone and which is manned by a set of young students from the Cambridge University who belong to the same fraternity and who want to be kept together. The naval authorities, and particularly Rear Admiral L. C. Palmer, chief of the Bureau of Navigation, believe this, as that officer stated to the House Naval Committee recently, to be "a very bad idea," because it was not desirable to encourage this inclination for non-separation.—*Army and Navy Register*, 9/2.

BELIEVES 6,000,000 TONS OF SHIPPING "POSSIBLE."—Rear Admiral Frederick R. Harris, manager of the Emergency Fleet Corporation after Rear Admiral Capps left that office, told the Senate committee investigating the shipping situation he believes the estimate of 6,000,000 tons dead weight as the production for the year 1918, made by the shipping board, is "possible."

He qualified this statement by saying that it would be possible only under the most favorable conditions, in which the resources of the country were coordinated.

The estimate of only 3,000,000 tons given the committee by practical ship builders he declared to be "pessimistic."

In the end, he said, the success of the project depended upon labor, and every effort should be made to get and use all the available labor for shipbuilding and to educate the labor up to the understanding that it was as important to build ships as to fight in the trenches or on war vessels to win the war.

Admiral Harris refused to criticise the present organization of the Emergency Fleet Corporation and the shipping board, though urged to do so by members of the committee.

"I don't believe in criticism that is not constructive," he said.

As for his own experience with the organization, he frankly said he could not work with it when Chairman Hurley called upon his, Admiral Harris', subordinates to report in person to the chairman without notifying Admiral Harris of the fact. He explained he had been used to the military and naval way of having the subordinate officials responsible to the officer above them, and that officer to the man above him.

He said that Rear Admiral Bowles, Rear Admiral Rousseau and others, all subordinate to him, had been instructed to report to Chairman Hurley

every day about what had been done and that they, not Mr. Hurley, had informed him of these orders.

Admiral Harris said Charles Piez the present manager of the fleet corporation, and while Admiral Harris held that office a kind of executive head acting for Mr. Hurley, had explained that such a proceeding was the "difference between naval methods and business methods."

Admiral Harris said he understood when he became manager that Mr. Piez was his superior and that Mr. Hurley was superior to all. He said he had no fault to find with that and that he and Mr. Piez had gotten along well together.

He denied that he had attempted to make contracts involving $12,000,000 for housing facilities at the shipyards on his own authority, as was published at the time he left office. He said he was convinced of the need of such an expenditure, but that he had laid the matter before his superiors.

Admiral Harris defended the fabricated ships, saying he believed when once they had begun to be turned out they would expedite the maximum output of ships.—*Washington Evening Star, 6/2.*

BUILDING AND LAUNCHINGS.—From reports received by the Shipping Board it is revealed that 901,223 gross tons of merchant ships were built in United States shipyards during 1917, being nearly double the figure of 1916. No official figures of construction in other countries during last year have as yet been received, but it is believed that we led the world in the output of new tonnage. In this connection it is of interest to note that 41 freight steamers and tankers aggregating 327,152 tons dead weight, which were commandeered by the Shipping Board last October, are expected to be put in service during this month and February and that the shipyards are making far better progress on this work than had been anticipated. Some 18 of these vessels will be commissioned this month.—*Marine Journal, 26/1.*

AMERICA TO GET JAPANESE SHIPS FOR WAR SERVICE.—The Shipping Board and representatives of the Japanese Government have about closed an agreement by which the United States will exchange one ton of steel for every two tons of shipping delivered to it by the Japanese Government and it is expected that the details of the agreement will be perfected in the near future.

Now that the United States has been pledged openly by the Secretary of War to land 500,000 men in France by next spring, it is imperative that the cargo ships of the United States be increased as rapidly as possible and that all tonnage suitable for transatlantic traffic be put into that service immediately. The negotiations with the Japanese have been dragging for weeks.

It has been known in semi-official circles for several months that the United States intended to take a much more active part in the military operations in France than was generally supposed, and it was common knowledge that the available tonnage under the control of the Shipping Board was wholly inadequate to the task of transporting supplies for the troops that were to be sent abroad. In spite of these circumstances little progress has been made in acquiring neutral or friendly tonnage.—*Evening Star, 8/2.*

FOR CHARTER OF SWEDISH SHIPS.—*Preliminary Agreement Entered Into Between the United States and Sweden.*—A preliminary agreement has been reached between the United States and Sweden, according to official dispatches from London, providing for the charter of Swedish ships to the United States to be used principally in the South American trade.

Some of the ships of the Swedish fleet now in American waters will be allowed to sail with their cargoes while others, it is understood, will be unloaded and put in the service of the United States. Negotiations are proceeding in a satisfactory manner and a final agreement is looked for shortly.

It has been decided to grant Sweden the privilege of purchasing and transporting oil cake, phosphates, kerosene oil and certain other commodities, but the chief point in discussion, the shipment of cereals and other food stuffs, has not been definitely settled.—*Baltimore American*, 29/1.

WILL CHARTER DUTCH STEAMERS.—Charter to the United States Government of all Dutch steamers now being held in American ports has been decided upon by the Dutch Government in a provisional agreement just signed in London.

The agreement provides charter for one round trip for upward of 80 vessels now in American ports. The vessels are not to go into the war zones, but five of the steamers will carry material for Switzerland and two will take cargo for the Netherlands Overseas Trust.

It is part of the agreement that the ships shall carry 150,000 tons of food for the relief of the Belgians, and may be used for other voyages later in American coastwise trade or elsewhere, possibly to Java for sugar.—*Nautical Gazette*, 24/1.

LABOR FOR SHIPYARDS.—Seeing that the passage of the administration's bill is assured authorizing the Shipping Board to expend $50,000,000 from the funds at its command in providing housing accommodations for shipyard workers, the Emergency Fleet Corporation has now started a nation-wide campaign to enlist a voluntary reserve army of 250,000 mechanics to insure the success of its shipbuilding program. This recruiting drive is being especially directed at skilled and semi-skilled workmen in industries not essential to the carrying on of the war, and labor at present employed on government contracts is not to be interfered with. On account of the curtailment in building, which is expected to last for the period of the war, the building trade is relied upon to furnish a large percentage of the required labor reserve. The automobile industry is also counted upon to supply a very considerable proportion. It has been even calculated that one-third of the workmen now engaged in garages and automobile repair shops could be easily spared for work in the shipyards. The authorities intend to have each state furnish a certain quota of the reservists needed, with the understanding that men will be employed within their home state as far as possible. Nevertheless, volunteers for the new force will be expected to pledge themselves to proceed, if so directed, to any part of the country where a demand for their services exists. What will certainly help the carrying out of the plans adopted is the likelihood of men of draft age, enlisting in the reserve, being called upon for service in the shipyards rather than in our army and navy units. To be able to render just as important a service to the nation as the men who go to the front, without having to submit to the rigors of military discipline, will doubtless appeal to many of our better-trained mechanics.—*Nautical Gazette*, 24/1.

NAVIGATION SCHOOL RESUMES.—The navigation school the United States Shipping Board is conducting in the custom house at Baltimore to furnish junoir officers for the big fleet of American ships that will go into commission this year has resumed sessions under the direction of Professor Lindau. Two sessions of the school are held daily. Young men who complete the course will be placed on ships to gain experience that will enable them to pass their examinations before the board of steamboat inspectors for this district in order to be granted licenses to take officers' berths on American ships.—*Evening Star*, 21/1.

ENGINEERS TO STUDY IN FACTORIES.—Chief engineers training for service on cargo ships of the United States Shipping Board are to be sent to factories to follow the construction of the engines from the very beginning until their actual installation in the vessels to which the men will be assigned. The details of the plans are being worked out by the director of recruiting of the Shipping Board.—*Evening Star*, 21/1.

TRAINING TO DODGE U-BOATS.—*Twenty-Five Liner Captains Will Enter School Off New London.*—New London, Conn., January 21.—Twenty-five captains of ocean liners were due to arrive here to-day for intensive training in methods for avoiding U-boats. This training will be under direction of United States naval authorities. Three naval officers have been detailed as instructors, and the converted yacht *O-We-Ra* has been assigned as school ship.

Every captain has a rating that would enable him to take command of the largest of ocean-going liners. The course will last all this week in relays of three days' duration, two days of which will be occupied with lectures and the third day to actual practice in steering the yacht in a course designed to frustrate an attack by a submarine.

An American submarine will go out into the sound and maneuver, showing the periscope, and give the captains a chance to avoid an opportunity to torpedo the ship. The *Fulton* is to act as mother ship for the school.—*N. Y. Times*, 22/1.

RADIO MEN FOR MERCHANT SHIPS.—About 3000 men of the navy are in training at Cambridge, Mass., for duty as radio operators, with a view to meeting the demands for such men for naval vessels and for transports and cargo ships.

Correspondence has been exchanged between the Navy Department and the Shipping Board in regard to placing under naval control the radio men of the merchant service. This is considered necessary on those ships that have naval gun crews, and it is contemplated that the ships traversing the war zone have regular naval radio men. So far there has been little difficulty in obtaining men for this service.—*Washington Post*, 17/2.

TORPEDO PLANT BLAST NOT CAUSED BY ENEMY.—Enemy plotting was absolved of blame for the explosion in the Naval Torpedo Station at Newport, R. I., January 26, in a statement by Rear Admiral Earle, Chief of Ordnance, to-day.

"Every man in the drying room was killed," Rear Admiral Earle said, "so there is no reason to suspect the work of an enemy."

The dry house mentioned by Rear Admiral Earle was located in the former bombproof in which 25,000 detonators which were being dried exploded. The total weight of the amount of fulminate mercury destroyed was 125 pounds.

Sympathy to the families of the men "who lost their lives in the performance of their national duty" was extended by the Ordnance Bureau here to-day in a letter to the inspector of the torpedo station.—*Baltimore Evening Star*, 31/1.

OIL RESERVES FOR NAVY.—In the annual report of the Director of the Geological Survey, Department of the Interior, just made public, attention is called to the creation of two naval oil reserves in Colorado and Utah.

The survey has been investigating the oil shales of the United States that give the most promise of yielding a commercial supply of oil and has explored large areas in Colorado and Utah that contain immense deposits of such shales, some of which carry 30 to 50 gallons of oil to the ton. This potential resource is estimated by the survey in terms of billions of barrels of oil, which it is believed can be economically extracted from the shales, possibly in competition with petroleum at present prices.

The Colorado reserve created for the navy contains 45,440 acres, and the one in Utah 86,584 acres.—*Official Bulletin*, 28/12.

ORDERS TEN CONCRETE SHIPS.—Contracts for ten 3500-ton concrete ships were let to-day by the Shipping Board to the Ferror Concrete Shipbuilding Corporation of Redondo Beach, Cal. The first vessel is to be delivered within six months and the other nine within a year.

The building company will use a new plan of construction, recently patented, by which it can build the vessels more rapidly than under old methods of working concrete.—*N. Y. Times*, 3/2.

ASKS SYSTEMATIC SURVEY OF ENTIRE PACIFIC COAST.—Although it will take 20 years to complete the surveys of the entire Pacific coast proposed by the coast and geodetic survey in a bulletin issued, benefits would be available within a year after the work was begun, the survey says.

For 21 years no systematic survey of water areas adjacent to California, Oregon and Washington has been made, says the bulletin. The cost for a vessel to do the work and 20 years' operation is estimated at $2,300,000.

Not only consideration for lives and property, but the need of preparing for maritime expansion dictates the necessity for beginning the survey immediately, in the opinion of the survey. The bulletin concludes:

"The end of the present world conflict will see the merchant fleet which we are now building released from the restrictions imposed by our need for transatlantic transport, sailing the seven seas in a struggle to regain the pre-eminence which was ours in the old days of the clipper ships."—*Washington Evening Star*, 24/1.

FIRE KILLS TWO MEN ABOARD DESTROYER.—An oil fire in the engine room of a destroyer, resulting in the death of two water tenders, Martin O. Callaghan, of Columbus, Ohio, and Charles E. Bourke, of Worcester, Mass., was announced by the Navy Department. No details were published. published.

The department also announced that Hector N. Menard, seaman, of Bridgeport, Conn., had been killed by a heavy sea dashing over the transport *Hancock* during a recent storm.—*N. Y. Herald*, 24/1.

TELLS OF FINDING EMERY POWDER IN GYROSCOPE.—Emery powder was found in a bearing cup of a gyroscope ready for shipment to the United States Navy to be used in a torpedo, according to the testimony of Charles Teitelbaum, government inspector at the E. W. Bliss Company's plant, when the trial of Paul Hennig on a charge of treason was resumed before Judge Chatfield in United States Court, in Brooklyn, yesterday.

Under cross-examination by Arthur K. Wing, Teitelbaum said that following the discovery on November 12 last he had approached Hennig and asked the latter to disassemble that gyroscope and that Hennig had sent him to a workman. He admitted that 10 days before Hennig had brought back a bearing passed in inspection and had shown that it was soft.

Ensign Joseph A. Flynn, of the *Arkansas*, told of the workings of gyroscopes in torpedoes. The trial will be continued to-day.—*N. Y. Herald*, 30/1.

AMERICAN AIRMEN BOMBARD GERMANY; ALL RETURN SAFELY.—*Four Aviators Unable to Determine Extent of Damage They Did Owing to Heavy Fogs.*—With the American Army in France, Sunday (Delayed).—Four American aviators attached to a French squadron have participated in a daylight bombing raid over Germany. All returned safely.

Because the weather was foggy the aviators were unable to determine just what damage was done, but as they flew fairly low over the targets it is believed the results were good. After recrossing the lines the bombers were fired upon vigorously by enemy anti-aircraft guns. They then ran into still heavier fog, and some of the airmen were forced to land before reaching their hangars.—*N. Y. Herald*, 29/1.

MAY CALL FILIPINOS INTO SERVICE.—Authority to call into the United States service Philippine military organizations is given the President in a House bill passed yesterday by the Senate and sent to the White House.—*Evening Star*, 19/1.

TRAINING CAMP FOR PORTO RICANS.—Secretary Baker to-day announced the establishment of a second officers' training camp in Porto Rico, for 400 selected Porto Ricans. The camp will open February 1 and run three months.—*Evening Star*, 9/1.

TEACH WAR PHOTOGRAPHY.—*Columbia Announces the Opening of a New Department.*—Columbia University announced the organization of a School of Military Cinematography for the United States Government to train war photographers. The school, the only one in the country, will enroll 100 students and will be under military regulations. It is assumed that the students will be drafted men who have had experience in photography. A faculty of seven military men will give instruction.

The men will be quartered at the university, sentries will be posted and no student may leave the school without a military pass.—*N. Y. Times*, 9/1.

The United States Army in France will total 500,000 early this year. Pershing has taken over a section of the front in Lorraine, where the

THE REGION BELOW VERDUN IN WHICH EARLY ACTION MAY TAKE PLACE.

American troops have been engaged in the usual trench raids and have shown up well in the fighting. The artillery is reported to be doing excellent work.

MEXICAN SERVICE BADGE.—Officers and enlisted men who participated in the Vera Cruz expedition under the late General Funston, the punitive expedition into Mexico under General Pershing, or who have under certain conditions served on the Mexican border patrol will be eligible to wear a new service badge with ribbon, which has been authorized by the Secretary of War, with the approval of President Wilson. The following general order issued by the War Department states who will be permitted to wear the new badge:

"1. By authority of the President, a service badge with ribbon, to be known as the Mexican Service Badge, will be issued to all officers and enlisted men who are now, or may hereafter be, in the military service of the United States and whose service has been under the following conditions:

"(a) In Mexico, afloat or ashore, as members of the Vera Cruz expedition, between April 24, 1914, and November 26, 1914.

"(b) In Mexico as members of the punitive or other authorized expeditions between March 14, 1916, and February 7, 1917.

"(c) Those who were actually present and participated in an engagement against Mexicans between April 12, 1911, and February 7, 1917, in which there were casualties on the side of the United States troops.

"(d) Those who were present as members of the Mexican border patrol, between April 12, 1911, and February 7, 1917, in proximity to an engagement between Mexicans which resulted in casualties among their own company, troop, battery, or detachment.

"2. The distribution of this badge will be governed by the provisions of Article VIII, Compilation of General Orders, Circulars and Bulletins, War Department, 1881-1915. No individual will be entitled to more than one Mexican Service Badge.

"3. Persons not now in the Army of the United Sates, who, if they had remained in the service would be entitled to this badge, and whose separation from the service has been honorable, may apply to the Adjutant General of the Army for authority to purchase and wear the Mexican Service Badge."

The badge will be of bronze, one and one-fourth inches in diameter. On one side will be the Mexican yucca plant in flower, with mountains in the background as suggestive of Mexico. Above the yucca plant are the words "Mexican Service," in the upper half and the lower half "1911-1917" arranged in a circle. The reverse side is the same as the Indian war badge. The ribbon is of silk and shows these colors in the order named, green, yellow, blue, green.—*N. Y. Times,* 15/1.

AIRPLANE PRODUCTION.—Whatever may be the popular opinion of Fuel Administrator Garfield's order suspending business to relieve the coal situation, the wisdom of his rule exempting the airplane industry from the restrictions of his proclamation will be generally recognized. It would have been lamentable had the construction of aircraft been checked for a day, or even an hour.

We know now that we are not to have 100,000 planes in the air this year, nor anywhere near that number. In a recent statement Howard E. Coffin, Chairman of the Aircraft Production Board, exposed the futility of this hope, a hope based on the knowledge of America's industrial achievements of the past and the conviction that, in the building of weapons to strike Germany through the air, effort would be strained to the utmost.

The experience of our allies has shown that the maintenance of each machine at the front necessitates the employment of between 40 and 50 men in auxiliary branches of the service, or an army of more than 4,000,000 in the aviation service alone, were this hope to be realized.

But the shock to us of this enlightenment was probably no shock at all to those who have looked, and still look, to us for help in destroying, once and for all, Prussian militarism.—*N. Y. Times,* 20/1.

GENERAL STAFF REORGANIZATION.—The reorganization of the general staff, as announced in a bulletin from the War Department last week, was necessary, not only to meet the conditions of war, but also because the general staff had ceased to perform the functions originally intended to devolve upon it. It has departed so far from the object contemplated by Elihu Root, who was Secretary of War when it was created, as to have become a part of the executive machinery of the War Department.

In addition, it has intervened between the Secretary of War and the bureau, and has separated the experts of the staff corps in the War Department from the head of the department until the latter has come to depend almost entirely upon the chief of staff for his information of army conditions and needs. The result has been a Secretary of War that not always has possessed a knowledge of the military situation, save as it may have been imparted to him by general staff views or incorrectly obtained through an imperfect acquaintance of general staff members with the situation.

Further, the personnel of the general staff has changed to such an extent since commencement of the war, due to the natural desire of members to be

relieved for duty in the field and with the line, that the permanence of membership, at one time regarded as so essential to successful administration, has been lacking.

The introduction of the war council into the War Department machinery has been bewildering, and this is not lessened by any of the War Department bulletins that have sought to explain the relationship between the general staff and the war council.—*Washington Post*, 17/2.

ENLARGEMENT OF THE DRAFT AGE LIMITS IN FUTURE SELECTIVE SERVICE ACTS ARE DISCUSSED IN GENERAL CROWDER'S REPORT.—Discussing the enlargement of the age limits for selective military service, Provost Marshal General Crowder says in his report to the Secretary of War:

Should the class of draftable persons in future drafts be enlarged or diminished, as to the ages to be included?

A pronounced majority of the boards favor some enlargement, but there is great diversity of opinion as to the proper age limit. Nineteen and 35 are perhaps the limits most frequently suggested; but some recommend 40 or 45 years as the upper limit. There is a distinctly stronger demand for raising the maximum age than for lowering the minimum.

The reason given for advocating this enlargement is the fact that there are many good men under and over the present limits who could more easily be spared than an equal number within the limits.

The following additional suggestions are made by a number of boards: (1) That young men who are under age should come within the law when they reach the minimum draft age; (2) that young men of 18 or 19 should be enrolled and trained, so as to be ready for active service immediately upon attaining draft age.

It is obvious that we are at the threshold of this problem in our further provision for the conduct of the war, and that a wise foresight should be employed in settling it.

The two most important preliminary inquiries are: What are the numbers of available men in the additional age-groups? Which groups can we least afford to draw from?

Available Numbers by Groups.—The available numbers are as follows:

Male population available 1918:

Males, 31-45 years, both inclusive (estimated)	10,683,249
Males, 21-30 years, both inclusive, not yet called	6,503,559
Males, 18-20 years, both inclusive (estimated)	3,087,063
Males arriving at age 21, between June, 1917, and June, 1918 (estimated)	1,000,000

Inasmuch as most (96 per cent) of the age 18-20 group are not married and most (77 per cent) of the age 31-45 are married, it will serve sufficiently the purpose to estimate the number of single persons available in each of these groups, and then to take the probable number of acceptances, as shown by the percentage of acceptances in the first draft. This estimate results as follows:

Probable acceptable men in age groups	Gross number	Probable acceptables Per cent	Net numbers
Single males 31-45 years (estimated)	3,525,472	39.41	1,389,388
Single males 21-30 years not yet called	3,354,086	39.41	1,321,845
Single males 18-20 years (estimated)	2,963,581	39.41	1,167,947
Single males arriving at age 21 (estimated)	960,000	39.41	378,336
Total	10,803,139	.. ..	4,257,516

These figures show us the respective sizes of the available reservoirs to be drawn from.

In considering the grounds of preferences for the two groups not now liable to service, conflicting considerations meet us. The younger men are

generally deemed to make the soundest and most pliable military material. On the other hand, the older men are more likely to yield in large numbers the occupational skill so necessary in the varied composition of the modern army. Moreover, under the rational selective-service system, which seeks to distribute the burden equally among the willing and the unwilling, it is important, if not essential, to include the older men, because a smaller proportion of them are likely to enlist; *i. e.*, to enter the army voluntarily without waiting for the call of the law. If the age limits were not enlarged to include the older men for raising the needed numbers, too large a proportion of the younger and more aggressively patriotic men would be withdrawn from civil life, thus unduly injuring the coming generation.

In view, however, of the considerable number of men already available under the law, the main reason for enlarging the age limits at this time is to distribute the burden more equally, in preparation for a later situation of need that may arise. From this point of view, the extension might well be both upward and downward, by way of a registration of all ages 19 to 21 and 31 to 45.

In any event, the greatest caution should be exercised not to interfere with the technical training of the younger group of men. The higher training should be protected from undue inroads; for it is there that the practical sciences are being developed. Both war and industry must be able to count upon a continuous and ample supply of trained young men. The experience of continental countries here has its lessons for us. The technical courses should not be allowed to be gutted. Already, by volunteering alone, many or most colleges have lost (on the average) 50 per cent of their students. The number at stake is not large in respect of the mere man power of the army, but it is potent in its possibilities for service if properly trained.

A wise expedient would be (if the age limits are lowered to 18 or 19). (1) to require every technical student in a recognized college to enter the enlisted reserve corps, and to relieve him from call by a local board during the completion of his course; (2) to require every such student to take a course of military instruction and drill for each of such years, or to enter an officers' training camp during the summer; (3) to appropriate the sums necessary to provide military instruction and drill at every college furnishing a unit of 100 men. By this means, the vital demand for educated young men could be filled, and at the same time their preparation for military service when needed could be insured.—*Official Bulletin*, 25/1.

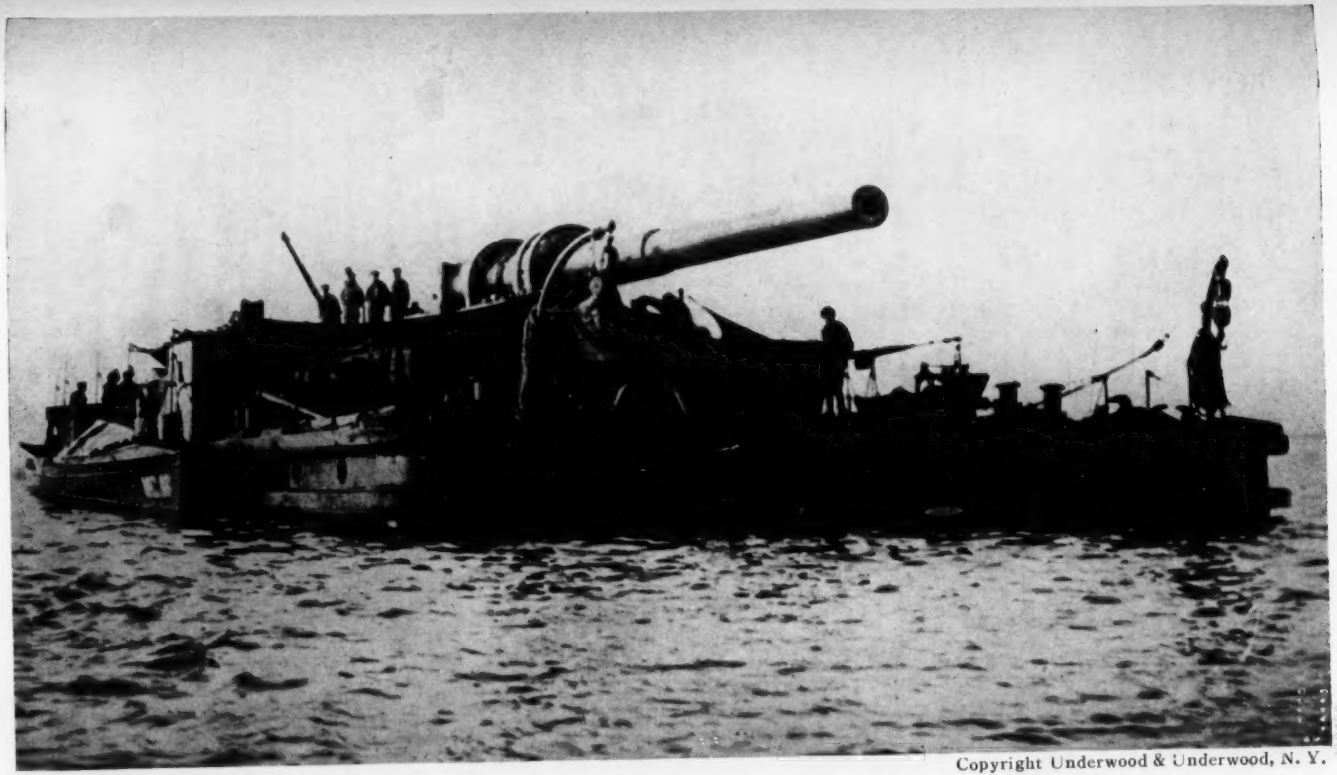
ORDNANCE AND GUNNERY

SUBSTITUTES WOOD FOR COTTON IN EXPLOSIVES.—A discovery which may revolutionize the munition industry in this country was announced recently, when it was declared that wood cellulose had been used successfully for the first time in the United States as a substitute for cotton in the manufacture of explosives. W. E. Byron Baker, a chemist, of Lockhaven, Pa., announced the discovery in a paper read at the third annual convention of the American Paper and Pulp Association at the Waldorf-Astoria.

The importance of the discovery can be realized by the fact that if German scientists had not made a similar discovery soon after the war began the German nation probably would be without means of producing explosives in necessary quantities, as cotton imports have been shut off from that country for nearly two years.—*N. Y. Herald*, 7/2.

A SHELL THAT WILL NOT RICOCHET.—The "non-ricochet" shell, a missile as deadly as the depth charge, is the newest device perfected by the navy ordnance experts for use against German submarines.

The new shell dives when it strikes the surface of the water instead of bounding, as do the ordinary missiles used in either naval or coast defence



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HEAVY ITALIAN GUNS BOMBARD ENEMY TRENCHES FROM MIDSTREAM IN LOWER PIAVE.

artillery. In addition, through the use of a new fuse the charge can be made to explode on contact with a solid surface under the water or at a predetermined depth.

The value of the latest anti-submarine weapon lies in the fact that shots which fall slightly short will be of as much effect as those which register direct hits. Pursuing its course beneath the water, the shell will explode against the side of the submerged submarine. Similarly, when these shells are aimed at a periscope of a submarine headed bow-on, there is a material increase in the chances that an overshot will take effect somewhere along the hull.

The Navy Department has forbidden the publication of details of the invention, but it is known that the British and French admiralties also have adopted it.—*N. Y. Times*, 23/1.

MINE SWEEPING DEVICE.—A mine sweeping device, calculated to pick up and safely bring to surface any mines that may be in the path of vessels is now being attached to a number of ships proceeding through the waters of the war zone. It is attached to the bows and when let down a netted projection extends a dozen or more feet on either side of the ship. If a mine is encountered it is picked up and brought to the surface at a safe distance from the vessel.—*Evening Capital*, 12/2.

NEW ARMY RIFLE.—Many favorable reports are being received with regard to the 1917 model United States shoulder rifle, which now is being produced at a greater rate than rifles ever were produced before in any country and in quantities sufficient for all troops that we may raise.

The rifle is modeled after the British Enfield, which used a rim cartridge of .302 caliber, but it represents many improvements over the British piece and is adapted to fire the caliber .30 rimless cartridge used in the Springfield rifle and in the machine guns used by the army, navy and marine corps.

Although those who have been instrumental in the design and the overcoming of the stupendous production problems incident to the turning out of the new rifles in quantities, are reluctant to speak of their accomplishments, they feel that they have done more than even they themselves expected, particularly in the rate of production that now has been reached.

Enough rifles are available for all troops in the service on duty that requires them. If there are any troops that have not been armed with the rifle, of either the Springfield or 1917 types, it is because of transportation difficulties, and not because the ordnance department has failed to have them ready in time. The new rifle will be ready in sufficient quantities for the men of the second draft by the time they require them.

Among other charges that have been made with respect to the new rifle is that the delays incident to the adoption of a new type have resulted in many troops being unarmed, it being stated that at some of the camps fully 50 per cent of the men had not received rifles. While it is not permitted to state exactly what proportion of troops are required to be armed with a shoulder rifle, although, of course, that is well known in the service, it should be remembered that every army has a large number of non-combatants who do not carry a rifle, and that many of the combatant classes are engaged in field artillery and other work in which they have no need for such a piece.

Considerable criticism also has been directed against the ordnance department because of its insistence that there should be a reasonable amount of standardization or interchangeability of parts of the rifle in order that replacements of those easily removed and apt to become injured or defective could be made readily. This policy was followed only to the extent absolutely necessary, that manufacture of the rifle might not be retarded any more than essential to the production of a proper arm.

As a matter of fact, there are only seven parts of the rifle, instead of 57 as has been charged, for which it is prescribed that there shall be no

departure under any circumstances from such perfection as would permit interchangeability, although the specifications set out other parts for which interchangeability is desirable. Of course, any one that has no acquaintance at all with a small arm knows that a bayonet, for example, should be capable of being placed on any rifle and should not be such that it can be used only on the one with which it is issued; and those that have handled a rifle at all know that the bolt of the breech mechanism and magazine, for example, should be capable of transfer from one rifle to another. As was anticipated by the ordnance experts, there is criticism now on the other side—that is, to the effect that interchangeability has not been carried far enough.

The favorable reports coming in from troops using the rifle confirm the ordnance experts in their belief that the United States in the 1917 piece has the best small arm in the world, with the exception, perhaps, of the Mauser type of rifles used by the Germans, and that our small arm is in every way equal to that of the Germans.

The policy has been adopted of placing a rifle expert of the commissioned ordnance personnel on duty at every camp to which the new rifle is sent, in order to aid troops in its use. Major Smith W. Brookhart, of the Ordnance Reserve Corps, who has been on such duty at Camp Dodge, Des Moines, Iowa, reports that unusually high scores have been made in practice with the piece.

In one colored regiment, for example, an average of 44 bull's-eyes out of a possible 50 was made at a range of 100 yards. This is thought to be due, among other things, to two factors: First, the placing of the rear sight on the bridge of the receiver, and thereby bringing it 10 inches nearer the eye than on the Springfield rifle, and increasing the sight radius or distance between the front and rear sights; and, second, the open peep-sight, whereby the soldier automatically centers his eye at the center of the rear sight.

While at Camp Dodge, Major Brookhart conducted instruction in the use of the new piece, which was attended by members of the personnel of all grades, from general officer to private.—*Washington Post*, 17/2.

OUR NEW 16-INCH NAVAL GUN.—Admiral Earle states that a 16-inch 50-caliber test gun is practically completed at the Washington Navy Yard, and that it will be proved within the next two months. Twelve of these powerful pieces will form the armament of our new 42,000-ton 23-knot battleships. He also says that the bureau has ascertained that the life of the large-caliber gun has been underestimated, the 14-inch 45-caliber gun having been fired a number of rounds far in excess of that heretofore considered to be practicable. We presume these good results are largely due to our most excellent powder, which, being a pure nitrocellulose powder, has much less erosive action than those containing more or less nitroglycerin. This is a most valuable quality, for it will mean that the new 16-inch 50-caliber gun above mentioned can be given a velocity considerably greater than would be possible with some other powders, such for instance, as the English cordite. We do not know, of course, what this velocity will be; but it is conceivable that (thanks to our powder), we may be able to maintain a muzzle velocity of 2800 feet per second, and still get a reasonable accuracy-life out of the gun.

Not many people outside of ordnance circles understand what an intimate relation there is between the powder and the gun—that is to say, how greatly the efficiency of any weapon is tied up with the all-round efficiency of the powder. Evidence of this is seen in the fact that the new British 15-inch naval gun is only 40 calibers in length and has a muzzle velocity of not much over 2300 feet per second. This means that the British 18-inch gun is probably not over 40 calibers in length, and that its muzzle velocity is about the same. If this be so, it is evident that the question of erosion, which has always been a most serious one where cordite is used, has very largely controlled the design of the gun. High muzzle velocities, other

things being equal, mean a high rate of erosion, and low velocities mean relatively light erosion; and if they are getting only about 2300 foot-seconds out of the new 18-inch gun it would indicate that the British powder still contains a certain percentage of nitroglycerin. Now if, as we hope, the Navy Department intends to secure 2800 foot-seconds with the new 50-caliber 16-inch piece, its shells, weighing probably about 2200 pounds, will have a penetrating power at all ranges at least equal to that of the English 18-inch piece, whose shells must weigh, surely, not less than 3000 pounds. The trajectory of our gun will be much flatter, and until the developments of the present war, this would have been considered a great advantage.

But due to the extreme ranges at which actions are now being fought, the angle of fall is so steep as to bring extreme-range attack within the category of "high-angle" or "plunging" fire, and, as we showed in an article in our issue of April 7, 1917, it is not so much the side as the deck of a ship that is vulnerable to such attack. The angle of fall of the lower-velocity shells of the 18-inch gun will, of course, be much steeper than that of the high velocity 16-inch shell of our guns. The danger space of our shells will be greater and more hits will be made; but the 18-inch shells that do hit will strike the lightly-armored deck rather than the heavily-armored side of the enemy—so there you are.

The range of our gun is probably greater, as is also the danger space; on the other hand, there is no question that a 3000-pound shell falling at an angle of say 25 to 28 degrees, if it hits, would endanger the flotation of a ship more than a 2200-pound shell striking at an angle of from 18 to 22 degrees, even though the latter carried a higher velocity.

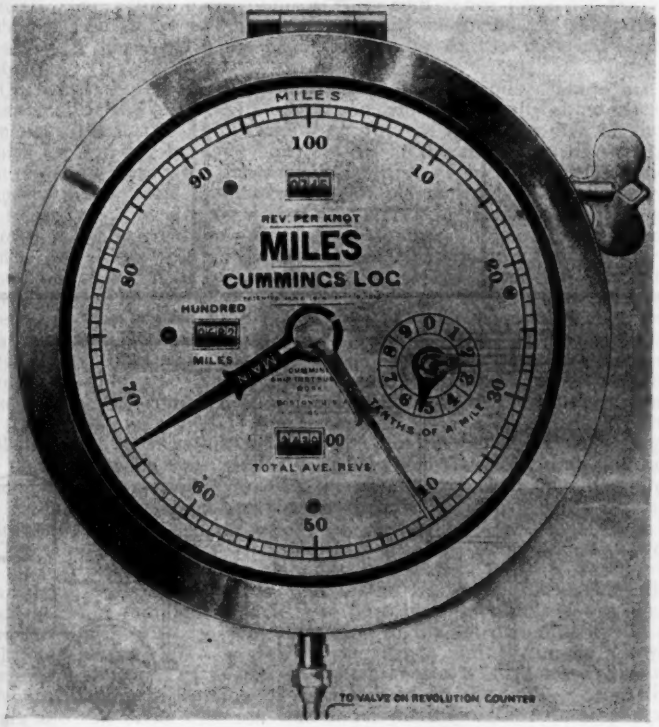
This is an interesting question, and there is much to be said on both sides. Personally we prefer our battery of twelve 50-caliber 16-inch to one of eight 40-caliber 18-inch guns.—*Scientific American*, 19/1.

A FRENCH BIG BERTHA.—According to a correspondent of the *Washington Post* in France, the French have outbuilt the German big Bertha of 42 centimeters caliber, and their artillery now includes the 52-centimeter mortar. He states that the length of the new gun is such as to render this piece practically a howitzer. The same authority states that one of these pieces was used in the Verdun surprise attack of last August, and also in the Chemin-des-Dames attack in the neighborhood of Laon, where its huge projectiles wrecked the entrances to the quarries and prevented the men inside from reinforcing the first-line troops engaged with the enemy. Two shells from the "52" sufficed to wreck Fort Malmaison.—*Scientific American*, 9/2.

NAVIGATION AND RADIO

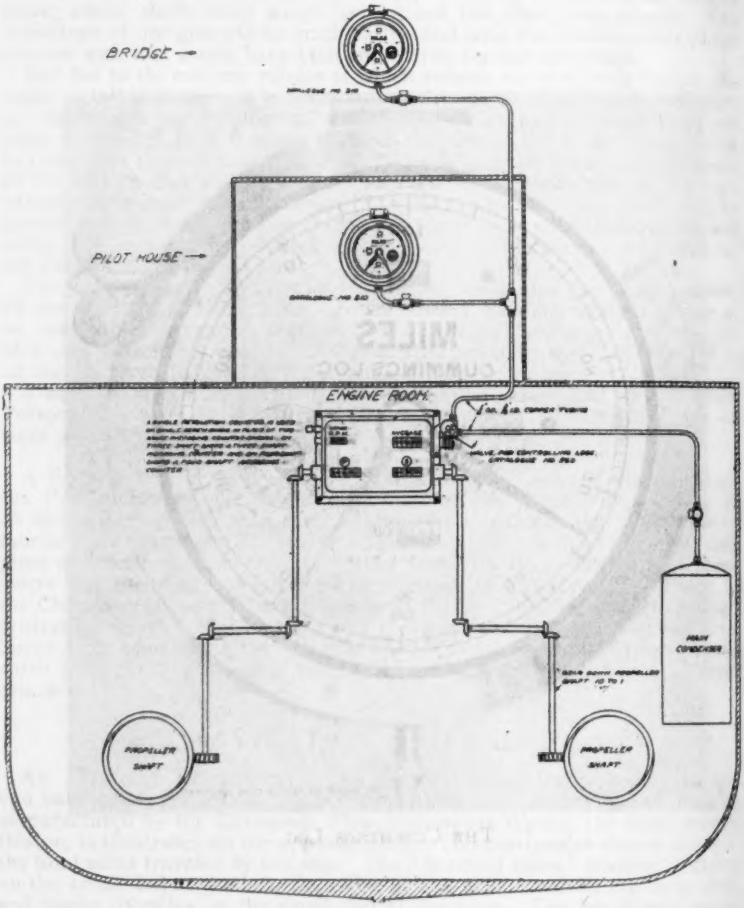
AN EFFICIENT INSTRUMENT.—The Cummings log for passenger, cargo and battleships, torpedo and patrol boats, and for submarines and yachts, manufactured by the Cummings Ship Instrument Works, 110 High street, Boston, is illustrated on the opposite page. This instrument shows directly the total miles traveled by the ship. The "hundred miles" reading is given on the small dial at the left, the miles by the main hand on the large dial and tenths of miles on the small dial at the right. The log shown reads 58,266.5 miles. The course hand on the large dial indicates that the ship had traveled 41.2 miles since last set to zero. This hand, which is carried by friction on the shaft of the main hand, can be set back to zero at any time without altering the main reading.

On the bottom of the large dial are given the total average revolutions of the engines. The small dial at the top labeled Rev. per Knot is set to the number of revolutions of the propeller necessary to drive the ship one mile through the water. The removable key at the right is for altering this ratio as conditions change. A mere glance at the dial of a Cummings log enables the navigator to secure accurate results when running by dead



THE CUMMINGS LOG.

reckoning. This device is not a continuous moving indicator, but moves up in steps, and the two zeros shown on the dial should always be added to the reading when determining total average revolutions on a 50-cycle log. This instrument steps up the distance the ship is forced through the water by 50 revolutions of the propellers, thus the reckoning is not dis-



DIAGRAMMATIC INSTALLATION OF LOGS AND COUNTER ON TWO-SHAFT SHIP.
Note pneumatic connection from condenser to logs through controlling valve on counter, and geared connection from shafts to counter.

turbed when engines slow down or stop. The manufacturers have published a pamphlet which gives a complete technical description of this log, together with illustrations that they will gladly send to anyone interested.—*Marine Journal*, 2/2.

TIME ZONES AT SEA.—There are several matters of time reform in the air (or on the carpet, as the French say), one of which, at least, will probably be realized in the not distant future, for the scheme is already well advanced. This is a proposal to extend the hourly zone-time system, generally used on land, to the ocean, and the suggestion is that time should be kept according to this system both on the vessels of the navy and of the mercantile marine. The scheme originated with our French allies, who have decided to adopt it in their navy, and it has been discussed at an official conference in England by representatives of many important interests. The actual proceedings at this conference have not been made public yet, but there can be no impropriety in giving the substance of a note which appeared in the *Comptes Rendus* of the Paris Academy for July 23.

On board ship there are timekeepers of two kinds. There are chronometers for the purpose of navigation, which naturally show Greenwich time, and there are the clocks in use for the every-day life of the ship, which are set day by day, more or less at the discretion of the captain, but, speaking generally, show the local time of the place where the ship happens to be. It is this latter class of instruments to which the reform is to apply. It is proposed that the clocks on board ship shall always show a time which differs an integral number of hours from Greenwich time. The clocks need not be altered immediately on entering a new time-zone; but this will be left, as before, to be controlled by circumstances. These clocks, however, will always show the time of some hour-zone—preferably that in which the ship then is, and the number of the zone that the clock is then keeping is to be exhibited beside the clock; and in any entry of time made from the clock, in the ship's log or elsewhere, the number of the zone is to be entered. The numeration of the zones was discussed at the conference, and it has been decided that they should be +1, +2, +3 . . . West from Greenwich, —1, —2, —3 . . . Eastward. All this may seem rather unimportant, but the result of the change will be that Greenwich time can be deduced from the clock time quite easily; and it has been decided that in the case of wireless messages the time of sending shall always be given in Greenwich time, which illustrates the purpose of the new scheme.

The other reforms referred to above emanate from this. It is proposed in the first place that the astronomical day shall be made to agree with the civil day; or, in other words, that in the National Ephemerides the day shall begin at midnight, which is to be 0 hours, and the hours are to be numbered from 0 to 23. The alteration of the astronomical day is a very debatable matter, and the Astronomer Royal and Professor Turner are the joint signatories of a letter in the *Observatory Magazine* of this month, which asks for the opinion of astronomers on the point. More than 20 years ago this same question was under discussion, but nothing materialized. The cognate question of numbering the hours of the civil day from 0 to 23, which was also discussed at the earlier date, will probably again arise.—*Scientific American*, 5/1.

DAILY WIRELESS SERVICE BETWEEN ITALY AND U. S.—Direct radio communication between an Italian Government station in Rome and the Arlington station of the United States Navy here has been successfully established, and daily use is being made for communications passing between the two governments.

The daily statements of the Italian war office will be received by radio from Rome and issued here for publication in the United States.—*Evening Star*, 22/1.

U. S. RADIO STATION IN FRANCE.—The Navy Department is erecting a high-power radio station in France at a cost of $2,250,000, which will be ready for operation in August next. The French Government will take it

off our hands after the war is over. It will be used in connection with the great station fast nearing completion at Annapolis, which will be three times as powerful as the one at Arlington, Va. The present French stations are not powerful enough to get communication across the Atlantic Ocean, being of about the same power as the station at Arlington. All of the equipment and structural parts are being made in this country for the foreign station. A station is also being built in Porto Rico. The British are establishing a high-powered station in the Azores, which will be valuable as a relay station. At present about 30,000 words a day are possible by wireless, and the new station at Annapolis will add 50,000 words per day. The greater part of the communication at the present time is by cable. If the cables are cut, it is estimated that the Annapolis station and Sayville and Tuckerton would probably be able to take care of all absolutely necessary military business. There is but little necessity for the use of the Pacific coast stations at this time, as practically all of the naval operations are on the Atlantic coast.—*Army and Navy Journal, 2/2.*

ENGINEERING

LIBERTY MOTOR A BRILLIANT SUCCESS.—One of the latest and most insidious efforts of enemy propaganda to spread discouragement among the civilian population back of the fighting lines is seen in the presistent rumor that the Liberty motor is a failure, and that the output of airplanes is small and far behind the promised program.

We are in a position to state that not only is each of these statements a deliberate falsehood, but that the motor has exceeded the most optimistic forecast of its performance, both as to horsepower delivered and durability, and that the output of planes is keeping pace with the construction of motors. Both motors and planes are being built at a pace which ensures delivery in 1918 at the rate proposed when the appropriation of $640,000,000 was authorized for their construction.

The work of translating this vast sum, with the greatest possible speed, into a fleet of airplanes and enlisting and training the personnel, so that we may be prepared to launch a great aerial offensive against the enemy in the summer of 1918, is in the hands of the Aircraft Production Board under the chairmanship of Mr. Coffin, and the Signal Service Corps of the army under Brigadier General Squire. The enterprise has been greatly favored by the fact that, in the matter of organization, and in the personality of these two men, it is singularly free from that red tape and professional inertia which has proved so disastrous in some features of our military preparation. The public will be gratified to know that the whole of this vast work, entailing expenditures at the rate of $50,000,000 a month, is swinging along harmoniously and swiftly to its completion at the date assigned.

We have already emphasized the fact that, although the motor is American in type and design, it embodies the best of the accumulated experience of the British, French and Italian aeronautical experts. Our engineers had before them even the designs of the very latest German motors; something that was made possible by captures of enemy machines on the western front. For these reasons it is not surprising that we should have produced a motor which is a distinct advance upon anything as yet turned out on either side of the fighting front.

Since "time is the very essence of this contract," it was obviously desirable to design a standardized motor, which would lend itself to that quantity production which has made possible the enormous output of American factories, and particularly of those devoted to the automobile industry. And in spite of the widespread belief that the building of motors for military airplanes could be done only in such highly specialized individual plants as are found in Europe, the tests (severe and prolonged) to which

the Liberty motor has been subjected prove that an equally fine product can be made by our quantity-production methods.

It has been urged that, in view of the rapid improvement in military aircraft, it was inexpedient to tie ourselves up to a single type which, however good at the date of its design, might be outbuilt by the time our new fleet was completed. In answer to this it should be noted that the Liberty motor is to-day well in advance of current practice. Thus, the celebrated Rolls-Royce (according to Major Vincent), which weighs 950 pounds "has never authentically developed more than 360 horsepower"; whereas the Liberty motor develops more than 400 horsepower at 1625 revolutions, on a total weight of only 800 pounds.

In view of these facts, coupled with the severe tests to which it has been put, it is not surprising to learn that the allied governments have placed large orders in this country for the new motor.

Not only is the motor "ahead of the game" in respect of its output per weight and total output, but, at a recent meeting of the Society of Automotive Engineers, it was stated by Charles M. Manly, vice-president of the society, that "the men who are in charge of the government's aircraft program have made every possible provision for the improvement of the design with the least possible interference with production." In other words, it will be possible to introduce new features or improvements on later lot orders, "so that the government will never be tied up with a lot of obsolescent machines in process of manufacture."

Mr. Vincent states that the new motor is to be used on the machines of every type—speed scouts, battleplanes, observation and bombing machines and seaplanes: though these now being built are intended for heavy battle and bombing planes. There are two varieties: one for use at very high altitudes, another for seaplanes operating near sea level.

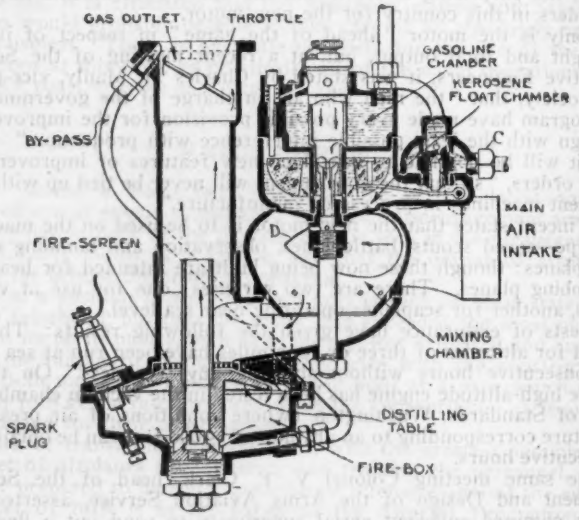
The tests of endurance have given the following results: The engine designed for altitudes of three or four miles have been run at sea level for eight consecutive hours without showing any weakness. On the other hand, the high-altitude engine has been tested in the vacuum chamber of the Bureau of Standards, Washington (where conditions of air pressure and temperature corresponding to an altitude of 35,000 feet can be obtained), for 50 consecutive hours.

At the same meeting Colonel V. F. Clark, head of the Section of Experiment and Design of the Army Aviation Service, asserted that if America obtained sufficient aerial superiority to send out a fleet of 500 bombing machines to destroy German lines of communication, there would not be much left of the war.

Undoubtedly; and when the full measure of our manufacturing capacity comes to be applied—as it ultimately will—we shall be in a position to send over the enemy terrain not one, but many raiding fleets of 500 machines each.—*Scientific American*, 26/1.

CARBURETOR WITH SPARK PLUG; A NEW DEVELOPMENT FOR VAPORIZING KEROSENE.—Mention has previously been made in these columns of the kerosene carburetors which operate on a partial combustion principle in which a portion of the liquid was burned to make a gas of the remainder of the vapor passing through the mixing chamber. In view of the interest prevailing at the present time in the action of various devices intended to burn kerosene, and inasmuch as there is apt to be shortage of gasoline as the result of the abnormal demands of war time conditions, particular interest is evidenced now in various types of kerosene vaporizers. In the form illustrated in the accompanying diagram, it will be evident that heating the mixture and securing heat to vaporize the heavy fuel is obtained by utilizing a portion of the carburetor as a fire box and putting a spark plug in this portion in order to secure the kindling of the gas when it is desired to start the engine after it has been standing for a time. This does not correspond to or is it a part of the mixing chamber, but is located

below it, so that the heated air and mixture from the preheating chamber rises through a stand pipe to go directly past the throttle. Since the heat is provided in the carburetor itself, there is no need of a hot air pipe from the exhaust manifold, nor is it necessary to jacket the carburetor. Gasoline is used for securing an easy start and priming so there is incorporated with the carburetor a gasoline supply reservoir above the float chamber through which the kerosene passes, so that the gasoline can be allowed to drip into the mixing chamber for starting purposes. The novel feature of using a spark plug in the carburetor is not a radically new one, inasmuch as it is covered by an English patent issued several years ago. A special form of spark plug is used, having but one electrode, this registering with a corresponding electrode screwed into the fire box body.



A KEROSENE CARBURETOR WITH A SPARK PLUG.

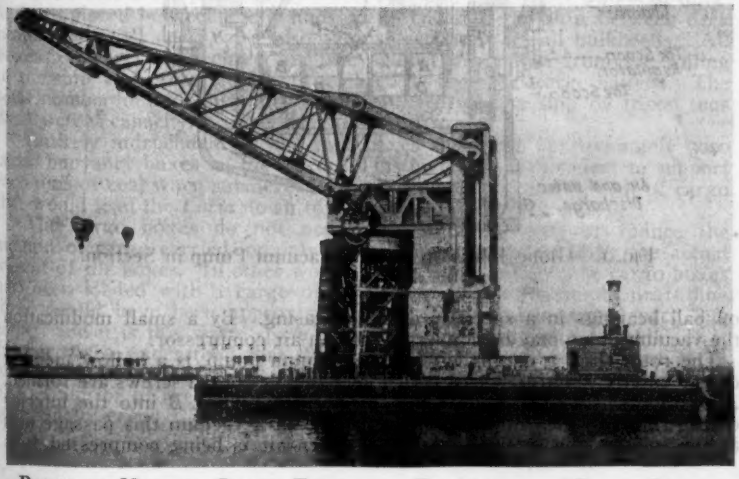
The fire box *J* is located at the bottom of the carburetor and contains an umbrella-shaped metal piece, *K*, known as the distilling table. The spark plug is connected in series with one of the plugs of the engine, so that with the four-cylinder engine there would be a spark plug in the fire box for every fourth spark in the engine. The fuel supply is directed to the float chamber in the conventional manner, the level therein being regulated by the usual float control mechanism. The gasoline supply is carried in a separate chamber above the float chamber. This chamber is filled through the action of a priming lever as the contents flow through the nozzle and into the air current by gravity. The current passes through the float chamber down through the nozzle and from there through four openings in the mixing chamber *D*, at the bottom, so that the fuel falls to the bottom opening into the curved surface *R* and falls from there to a baffle plate or supply screen *H*. Here it falls through the openings of a screen and drops to the top of the distilling table *K* and begins to float down the inclined surface of this table into the fire box, where it is ignited by the spark gap.

Only partial combustion occurs owing to there being an excess of fuel present and the resulting gas is drawn up through the fire box, through a vertical passage, back into the main stream of air from the mixing chamber and by the throttle which controls the amount of gas admitted to the engine.

It is claimed that after three seconds running the fire box is well heated and that in six to eight seconds the intake manifold is sufficiently warm to maintain uniformity of mixture to the cylinders. The device is so well heated that kerosene can be used in cold weather as easily as under more favorable operating conditions. All of the air flows into the one opening at the side of the mixing chamber, this opening being so formed that a downward whirl or eddy is imparted to the air, which carries the kerosene from the spraying nozzle. Once through the bottom of chamber *C* this air laden with kerosene vapor and globules of liquid, divides, part of it going directly above the stand pipe and part going down into the fire box, the amount going into the fire box being a relatively small portion of the total. The air entering the fire box through *E* is relatively free of fuel, so it picks up the kerosene dripping from the distilling plate. The lighter kerosene particles are carried direct as indicated by the arrows, while the heavier fuel particles go into the fire box, and are gasified before passing to the engine. It is claimed that the temperature can be regulated by raising or lowering the distilling table for which an adjustment is provided, so that its relation to the fire screen may be varied. On checking the draft on the fuel and air the temperature will be reduced by allowing greater draft, the combustion will be more energetic and the temperature will be higher.

When first starting this carburetor all of the fuel passes through the fire box and as soon as the distilling table temperature increases the more volatile elements are distilled from the fuel and the vapor thus produced results in a resistance to the flow of other than the heaviest bodies through the holes in the fire screen and this produces an increase of temperature in the member. As soon as pipe *G* is also heated to a point where all the lighter particles of fuel are well vaporized the heavy residue flows into the fire box to be partially burned. Great flexibility is claimed for an engine equipped with this carburetor, as it is believed by its makers that the use of a fixed gas is of more value than the ordinary system of attempting to vaporize a mixture with heavy liquid particles in it by the ordinary hot plate or heated jacket manifold construction.—*Scientific American*, 17/11.

LARGEST MACHINE OF ITS TYPE.—A 200-ton floating crane, built by the Wellman, Seaver, Morgan Company, Cleveland, Ohio, for the Norfolk Navy Yard, and the largest machine of its type ever constructed in the



BROADSIDE VIEW OF CRANE, TOWER AND PONTOON WITH POWER PLANT.

United States, is shown herewith in one illustration. This crane is mounted on a pontoon 140 feet long, 85 feet wide and 15 feet deep; it has a lifting capacity of over 200 tons, a reach of 62½ feet over the side of the boat, or a radius of 105 feet. The test load required by the navy, and which was handled successfully, was over 400,000 pounds. This crane resembles generally the ordinary revolving derrick in which the jib is rotated to the point opposite the weight to be lifted when it is lowered until the hooks hang above the object. The latter are then lowered or raised by means of steel cables passing over sheaves built into the end of the jib. The main hoist consists of two hooks fixed on the jib. When raised to its maximum height the latter is over 200 feet above water level, or it would tower over the roof of an eighteen-story building.

The crane rotates in a complete circle and this movement is controlled by two 60-horsepower motors. The boom luffs up and down from a practically vertical position to an angle of about 30 degrees in the horizontal in its lowest position and this movement is accomplished by two 10-inch screws, operated by two 60-horsepower motors.—*Marine Journal*, 26/1.

AIR PUMPS.—This rotary valveless air pump, designed to produce a high vacuum, consists of two main parts, the rotor and the drum, rotating

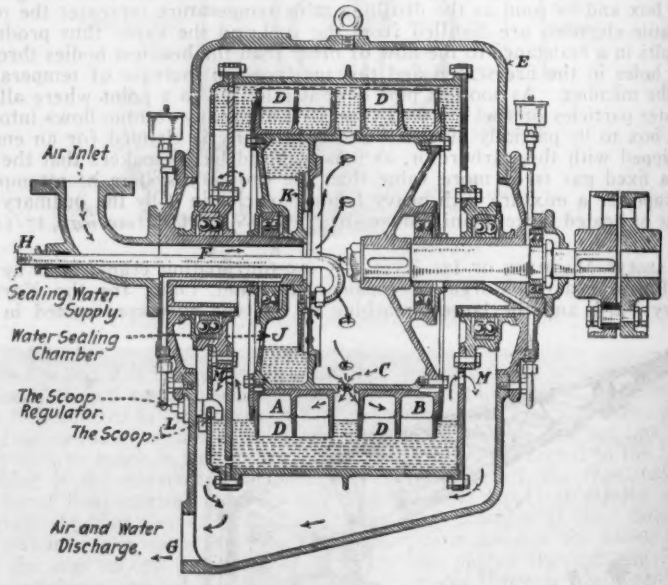


FIG. 1.—Globe-Johnston Rotary Vacuum Pump in Section.

on ball bearings in a specially designed casing. By a small modification the vacuum pump may be converted into an air compressor.

The rotor, Fig. 1, as applied for the vacuum pump, is a hollow member on the outer circumference of which deep double-thread screws are formed. A passage *C* runs between twin-screw threads *A* and *B* into the interior of the rotor. When the machine is producing a vacuum this passage acts as the inlet to the screw threads, but when air is being compressed it is

the outlet. Similarly, the pipe *F* running from the interior of the rotor to the exterior of the machine is the inlet pipe in the vacuum pump and the outlet pipe in the compressor. The screw threads are joined by a large number of narrow partitions or blades *D* which are equally spaced around the periphery of the rotor. The outer and inner edges of these blades are respectively flush with the top of the screw threads and half-way down the depth of the threads.

The ring of water is in the first place set up by the action of these blades in conjunction with centrifugal force. Annular rings *E*, called shrouding blades, fitted to the sides of the rotor and reaching somewhat below the water level on the discharge side, prevent the exhausted or compressed air from returning along the screws when the thread ends leave the water seal.

The rotating drum is a hollow cylinder also running on massive ball bearings. The drum when rotating contains the ring of water and is set eccentrically to the rotor. The relative eccentricity of the rotor and the water ring produces what is called the "working space."—*Engineering*, January.

INVENTOR OF NON-SINKABLE VESSELS EXPLAINS DEVICE.—*Buoyancy Boxes, Placed all Over Steamships, Will Render Ships Difficult Targets for Germans After They Are Equipped, Says William T. Donnelly.*—William T. Donnelly, naval consulting engineer, of New York, and a member of the Committee on Ship Protection of the United States Shipping Board, recently explained his invention for rendering cargo vessels non-sinkable. His work on the problem, he said, antedated the war by several years, and began when he found that a 20,000-ton non-sinkable dry dock he had arranged for the Grand Trunk Pacific Railroad proved a practical success.

Mr. Donnelly said that his patents for a non-sinkable ship, filed in the Patent Office, first directed attention to the invention, and that after careful study the Committee on Ship Protection submitted a report which General Goethals unqualifiedly approved. General Goethals, Mr. Donnelly said, also had recommended the application of the invention to the ships which the Emergency Fleet Corporation is building.

Generally speaking, Mr. Donnelly's scheme involves the use of "hull buoyancy boxes" and "cargo buoyancy boxes," the former supplying the necessary support for the ship itself, and the latter for the cargo. His description of his invention is as follows:

"The boxes are approximately 3 feet long and 2 feet wide by 1 foot thick, and are placed between the frames on the sides of the ship, between deck beams under all decks, and also against each side of all bulkheads. All boxes are carefully secured in place against movement from the rolling of the ship, and protected from the cargo by the usual cargo battens. The total number of hull buoyancy boxes on the *Lucia*, a ship of 10,000 tons dead weight capacity, was between 9000 and 10,000.

"Entirely independent of the hull boxes there are approximately 3000 cargo buoyancy boxes on the *Lucia*. This buoyancy is sufficient to support 8600 tons of coal when submerged in water, which was the amount of cargo that would load the *Lucia* down to her maximum draft line.

"The cargo boxes do not necessarily interfere with or reduce the amount of cargo carried, or only in an amount represented by the actual weight of the boxes. In other words, if the *Lucia* without the cargo boxes had been loaded with a cargo of coal down to her maximum draft line there would have been approximately one-third of her cargo space left empty, and it is this waste space that the boxes were devised to fill. It is further to be understood that these cargo boxes were so disposed as to protect the stability of the ship when water-logged, and also in those parts of the interior of the ship in which it would be more difficult to introduce and remove cargo.

"In case of other cargoes, the buoyancy boxes would be used in proportion to the weight to be sustained. In other words, the loading of the vessel to make it non-sinkable is an art to be developed with the thorough knowledge of the specific gravity of the cargo. In case of a cotton cargo, no cargo buoyancy boxes whatever would have to be used. My investigations show that the deduction in cargo space because of the buoyancy boxes will average between 10 and 20 per cent.

"The cost of the installing of the buoyancy and cargo boxes in the *Lucia* was less than 10 per cent of the value of the vessel.

"Regarding time of installation, the Ship Protection Committee now has before it an offer from a reliable concern to supply buoyancy boxes at the rate of 10,000 to 11,000 a day, and I believe that they can make a complete application to a ship of the same dimensions as the *Lucia* in from two to four weeks.

"The degree of safety achieved by these boxes can be judged from the fact that 12,000 boxes are distributed over the hull of a ship 400 feet in length, and that the largest breach of a torpedo does not exceed a hole 25 feet in diameter, which would probably destroy from 50 to 100 boxes. The margin of safety is such that from 80 to 100 feet of the side of the vessel could be destroyed without causing the ship to sink.—*N. Y. Herald*, 15/2.

AERONAUTICS

IS THE MONOPLANE COMING BACK AGAIN?—From France comes the report that the monoplane is again coming into favor in the French air service. The Morane parasol monoplane, in which the planes are placed some distance above the fuselage so as to give the pilot unhampered view, has been improved and is now being reintroduced. The Morane parasol was one of the three types of airplanes with which France entered the war, but after a few months of actual service it was dropped. In its present form this monoplane is said to be a wonderful climber and to possess a great speed.—*Scientific American* 2/2.

SMOKE CAMOUFLAGE FOR AIRPLANES.—It is reported that the Gotha airplanes which raid England from time to time, are equipped with apparatus for producing smoke clouds for purposes of concealment. The smoke cloud is usually emitted when the raiders are threatened by anti-aircraft artillery; and since it has the same color and formation as the fleecy clouds overhead, the task of the gunners below is made far more difficult.—*Scientific American*, 2/2.

FLIGHT (LONDON), DECEMBER 6, 1917.—*The Danger of Over-Standardization* (Editorial).—We are glad to hear that the Air Board has addressed a communication to the Aircraft Production Board of the United States on the subject of the danger arising out of over-standardization of aircraft, a subject to which attention has frequently been directed in these pages. As to the usefulness of standardization within limits there can be no two opinions, but it is quite possible for the keenness for output to work to our great disadvantage. In considering the problems attending the construction of aircraft, we have to keep it well before us that the design of to-day is likely to be rendered hopelessly obsolete by that of to-morrow, and it is thus folly of the worst description to put all our eggs into the one basket. We are not implying that that is the policy which is being pursued in America, but we do think there is a danger that our allies' enthusiasm for manufacturing efficiency and huge outputs might tend to lead them a little astray. Evidently this view is shared to some extent by our own authorities, and hence the warning which is said to have been given. No undue importance need be attached to the fact that the Air Board has thought it necessary to give America what may really be called a friendly tip. There is

certainly no divergence of opinion between us and our allies regarding the future of war in the air. All that has happened is that a little advice, born of our greater experience of war, has been tendered by the one and accepted by the other in the spirit of absolute friendship.—*Rudder*, 15/1.

MAKE COMPLETE LIBERTY ENGINES IN FORD PLANT.—All available parts of the Detroit plant of the Ford Motor Company not now engaged in government war work soon will be devoted to high speed production of Liberty motors for America's airplane fleets. The Detroit factory has been turning out cylinders and other engine parts for several months, but the new program disclosed to-day provides for wholesale production of the completed engines. Recent tests of the Liberty motor indicate that a minimum of 400 horsepower can be expected from the new engines.—*N. Y. Herald*, 13/2.

NEW PROPELLER SHAPING MACHINE.—"The Will to Win" has caused many ingenious machines to be designed for the purpose of speeding up the production of struts, propellers, and other pieces of airplane woodwork.

Extreme accuracy as to weight, balance and form is vital, and must be taken into consideration by the designer of any wood-working machine to make it a success on airplane parts. Especially is this true of the two-, three-, or four-blade air screws. For this reason many of the standard wood-working machines have proven altogether inadequate to these exacting needs.

One of the latest machines to be offered to the manufacturers of airplane woodwork is a special propeller shaping machine which will handle the three- or four-bladed screws, as well as the two-bladed ones. It is built by the C. Mattison Machine Works, Beloit, Wis.

The Mattison Company has thoroughly studied the requirements of a propeller lathe, and with the cooperation of some of the biggest manufacturers in the country has perfected a machine which bids fair to revolutionize the production of propellers, on account of greatly increasing capacity, as well as of much smoother cutting. This works so close to finished size that very little hand work is necessary after the machining operation. The manufacturer of this lathe will be pleased to supply to any one interested in the manufacture of propellers any detailed information regarding the construction and operation of the machine.—*Aviation*, 15/1.

AERONAUTICS (LONDON), NOVEMBER 21, 1917.—*A Zeppelin Surprise.* By Jhadoo Jahaz.—The writer examines the conditions which the Zeppelin airships had to fulfill, during their last raid on the British Isles, in order to reach the extraordinary altitude from which they delivered their attack.

For this purpose the author had at his disposal the following table of estimated weights of the Zeppelin *L-49*, which had been prepared by Mr. Warner Allen:

	Tons
Hull framework	12
Outer cover and gas bags	5
Planes	1
Framework of cars	1
Power plant	2½
Fuel tanks	1½
Armament, wireless	½
Miscellaneous	1
Total	24½

The gross lift of the modern Zeppelin being assumed as 60 tons, it follows that 35½ tons remain available for "disposable weights," such as crew,

fuel, bombs, and water ballast. Of this, 1½ tons are taken up by the crew, 5½ tons by the fuel supply, and 2½ tons by the bombs, so that the Zeppelin must carry in the neighborhood of 26 tons of ballast. The latter amount the Zeppelin fully needs for attaining the 20,000-foot level, provided allowance is made for additional dynamic lift.

It will be seen that these figures closely tally with those computed in the December 15 issue of *Aviation and Aeronautical Engineering*, although there is necessarily a certain variance between the two estimates of weights of the structural parts of the Zeppelin.—*Aviation*, 1/1.

MILITARY AIRCRAFT AND THEIR ARMAMENT.—*Tactical Maneuvers and Developments That Have Resulted.*—By Jean Abel Lefranc.—The technical elements to be considered in aerial combat are based upon the qualities of the aeroplanes engaged, such as armament, speed, facility in handling, altitude capability, etc. These tactical and technical elements may be divided into two sorts, which though very different are intimately connected.

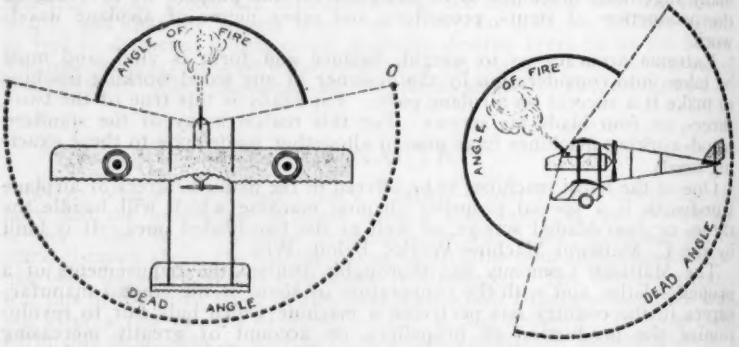


FIG. 1.—Firing Area and Obstructed Area of a 1915 Farman.

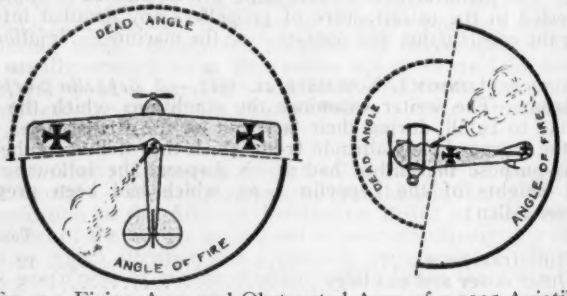


FIG. 2.—Firing Area and Obstructed Area of a 1915 Aviatik.

The combat begins by a series of tactical maneuvers by means of which the assailant seeks to get as many initial advantages on his own side as possible, by surprise, by a greater altitude, by a group attack, by a rear attack, etc. It is ended by the actual contest between the machines, continued till one side or the other is destroyed or put to flight.

It is evident that the preliminary tactics can be executed only if the technical qualities of the avion make them possible. Freedom to choose between engaging in combat or avoiding it implies superiority of speed.

If the machine possesses the four technical superiorities of the ideal airplane, speed, climbing, armament, ease of handling, then its pilot has all the tactical advantages on his side.

But an airplane may have a single one of these technical superiorities yet be unable to gain any tactical advantage therefrom. For example, the Voisin gun-airplane, with its 37-caliber rapid fire guns was superior in armament to most of the enemy airplanes of that period; but since it had no speed, was not easy to manage, and could not rise, in practice, above a height of 2500 meters (8125 feet), it was almost never able to profit by its advantage of armament. The enemy airplanes profited by their speed and

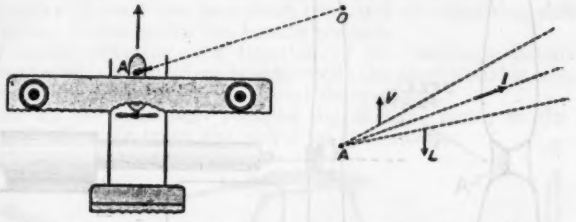


FIG. 3.—Deviation of Trajectories in Consequence of the Displacement of the Airplane.

facility of management to attack it without getting within its very limited range, their superiority in climbing enabling them to refuse combat by rising to a height of 5000 meters (16,250 feet). The technical elements are identical in all aeroplanes of the same type, but their employment in combat, *i. e.*, their tactical application varies with the ability of the individual pilot in each particular case. The utilization of the tactical elements is so dependent upon their intelligent application by the pilot that it often occurs that airplanes technically inferior in all points obtain tactical

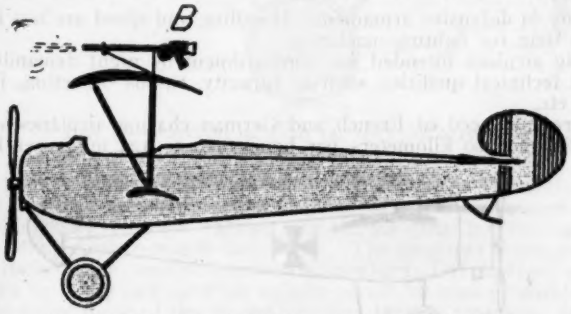


FIG. 4.—The Fixed Machine Gun of a Nieuport.

advantages by reason of the courage and skill of their pilots, and even absolute victories, over adversaries better armed, faster, and more easily handled, *e. g.*, the old Farmans of 1915 over the Aviatiks of that year.

Our "Aces" in particular furnish an excellent example of good tactical handling of their machines. In general, however, it must be admitted that technical superiority is the surest method of achieving tactical superiority in the fight. Superiority of material equipment has been the chief basis of all German tactics in terrestrial combat.

The relative importance of each of the technical factors in air fighting varies according to the work required of the machine. For a fighting air-

plane the order of importance is as follows: speed, ease of handling, armament, and altitude. The German pilots who have been taken prisoner declare that the superiority of the Nieuport and the Spad over the "chaser" Albatross lies chiefly in their extreme ease of handling, the other factors being practically balanced

Airplanes for artillery, photography, petty bombardment, or protection, which by reason if their specialization of function cannot be made fast enough to avoid combat, should be constructed with a view to technical

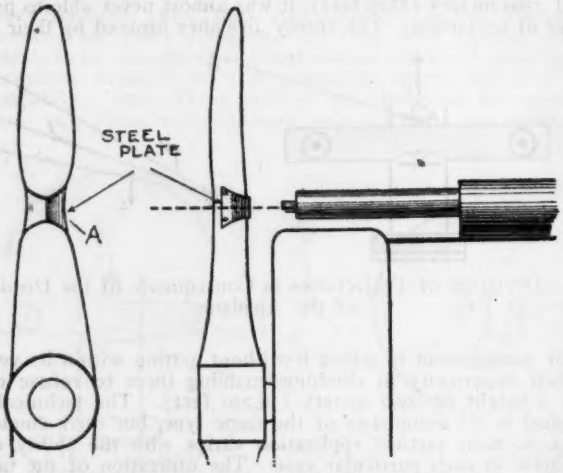


FIG. 5.—Garros Type Propeller for Firing Between the Blades.

superiority in defensive armament. Handling and speed are less important elements than for fighting machines.

The big airplane intended for bombardment by night demands entirely different technical qualities, such as capacity, radius of action, facility in landing, etc.

The present speed of French and German chasing airplanes varies between 180 and 200 kilometers per hour (110 to 123 miles per hour); it

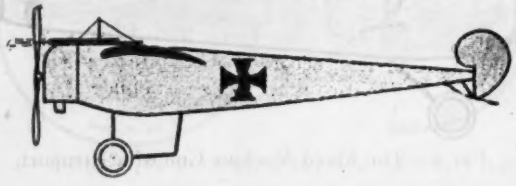


FIG. 6.—Arrangement of Gun in 1915-16 Fokker.

might be much greater but for the fact that these machines are obliged to keep enough wing-area to enable them to raise their weight of a thousand kilograms (2200 pounds) to a height of 5000 or 6000 meters (roughly speaking, 16,000 to 20,000 feet), and to land on a chance terrain without being upset.

The present speed of airplane of artillery, photography, petty bombardment, and protection is from 125 to 150 kilometers per hour (cc. 75 to 90

miles), while that of airplanes for night use may easily remain as low as 90 to 120 km. per hour (cc. 50 to 65 miles), in case the exigencies of capacity demand it.

No limit is set to improvement in ease of handling, especially in machines specialized for combat. Knowledge of the formidable strains and pressures which come into play on surfaces of an extent of 25 square meters (the spread of the Albatross chaser) has arrived at such a point of precision that all sorts of aerial acrobatics are permissible, especially for chasing airplanes without any fear, normally, of ruptures or deformations.

If there are still numerous accidents due to ruptures they must be ascribed to inevitable imperfections caused by the necessity of producing large quantities of machines in a short time and of entrusting delicate bits of construction to mechanics too hastily trained.

Facility in maneuvering is a function of the judicious distribution of the strains to which the airplane is subjected; the ascensional strain, gravity, and the strains resulting from the use of the controls.

But after all the armament remains the decisive factor in the combat, for it is this which destroys the power of the enemy.

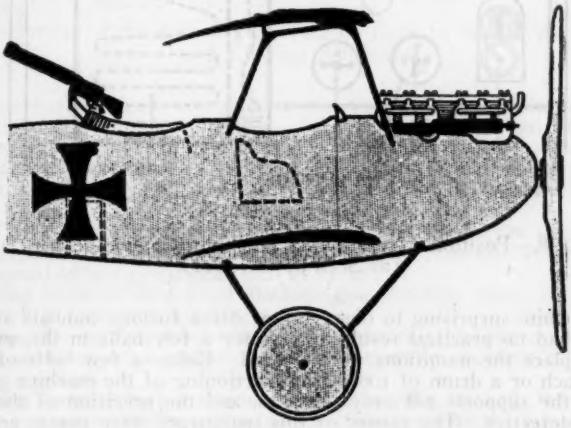


FIG. 7.—Position of Gun on 1917 Albatross.

I.—At the beginning of the war, when aviation had a relatively obscure rôle, and had not assumed the importance of a factor indispensable to victory, the necessity of the "mastery of the air" had not yet made itself felt, and aerial combat was a rare event. The airplanes went out armed with a carbine or rifle, and were generally careful to refrain from attacking. Then, little by little, each desiring to keep secret his own preparations, but seeking to know those of the enemy, combats became frequent. It became necessary hastily to mount machine guns with improvised supports which had to be perfected very rapidly. This was the first period of aerial combat, which had scarcely more than a single formula of armament. The airplanes, all two-seaters, were provided with a machine gun operated by the passenger.

The majority of the French airplanes, having the propeller at the rear, had behind them a considerably obstructed area or blind spot which favored surprise attacks. The machine gun, being generally placed on a pivot in the front of the nacelle, either to the right or to the left, made it difficult to defend the airplane on the sides (Fig. 1).

The German machines, having the propeller in front, had the machine gun at the rear. Their weapon was quickly mounted upon a pivoted turret which permitted it to be rapidly turned in order to fire to the right or the left. The obstructed area was in front and under the observation of the pilot (Fig. 2).

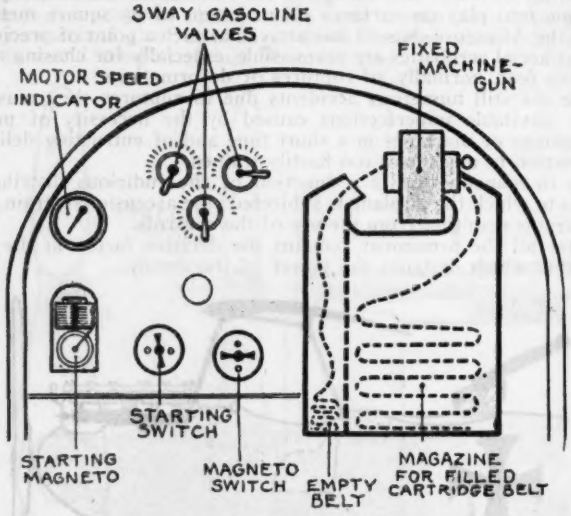


FIG. 8.—Position of the Fixed Machine Gun in the Fuselage (as Seen by the pilot).

It was quite surprising to observe how often furious combats at a short distance had no practical results except for a few balls in the wings. In the first place the munitions were limited. Either a few belts of 25 cartridges each or a drum of 100. The functioning of the machine guns was delicate, the supports not very practical, and the precision of the fire incredibly defective. The causes of this inaccuracy were many, proceeding

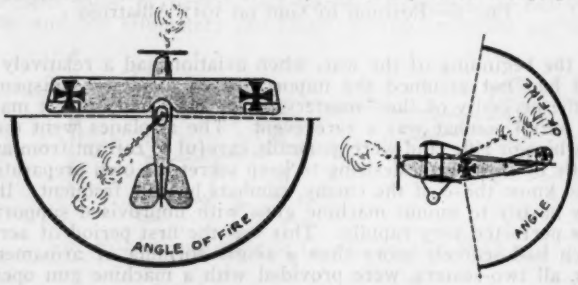


FIG. 9.—Firing Angle of 1917 Albatross C.

chiefly from errors of aim due to the relative speeds to the two combatants; but owing likewise to the very considerable vibration produced by these over-light machine guns, which prevented all accurate aim; also to the inconvenient positions the gunner was obliged to take in order to fire in the direction *O* as shown in Fig. 1; and finally to the difficulties in handling a heavy arm in a wind of 100 km. per hour (60 miles per hour).

Moreover, the trajectories of the shots fired, at the side, towards *O* (Fig. 3), were thrown out of line by new forces: the initial lateral speed, produced by the speed of the airplane (force *V* Fig. 3), the lateral wind pressure upon the projectile by this same speed (force *L* Fig. 3); two forces *V* and *L* which are compounded with the initial speed *I* of the ball and deform the trajectory.

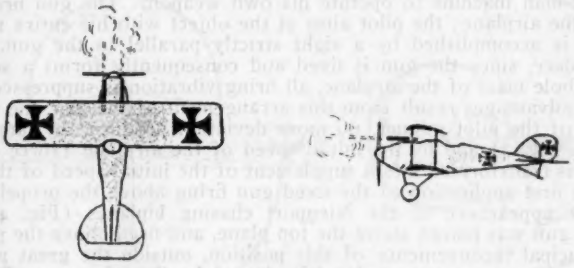


FIG 10.—Firing of the Two Fixed Machine Guns in the Forward Part of 1917 Chasing Albatross.

The sight of the gun, moreover, ceases to give a precise indication for arms which fire almost vertically, above or below, and but rarely in a horizontal plane. The distance of the shots is generally less than 400 meters (1300 feet) and if we note this element of error it is merely to add it to the preceding causes to show the great difficulties involved in aerial firing.

II.—The second period comprises the organization of the armament on board airplanes of specialized missions. Three principal formulas have been adopted by our enemies as well as by us:

1. Firing forward by a fixed machine gun shooting above the propeller or through it (one-man machines).

2. Firing forward by fixed machine gun shooting like the preceding, but with the addition of a machine gun on a tourelle shooting towards the rear (two-seaters).

3. Firing forward by a machine gun on a tourelle, towards the rear by a machine gun on a tourelle, and under the fuselage with the gun on a pivot (three-seaters).

FIG. 11.—Parabellum Mitrailleuse Movable on a Tourelle.

A, lateral reel carrying a band of 250 cartridges; *B*, sack into which the shells are ejected; *C*, jointed fork; *D*, carriage revolving on the turret. Weight 12 kilograms (26 lbs.). With 250 cartridges and accessories 32 kg. (70.4 lbs.).

The constructors have been led to study the formula of fixed firing towards the front, either through the propeller or above it, in the first place to enable one man machines to become fighting machines, and next to avoid all the inconveniences indicated above in the case of movable guns on tourelles or pivots.

Evidently the first result of employing a fixed gun is to enable the pilot of a one-man machine to operate his own weapon. The gun fires in the axis of the airplane; the pilot aims at the object with his entire machine; the aim is accomplished by a sight strictly parallel to the gun. In the second place, since the gun is fixed and consequently forms a solid part of the whole mass of the airplane, all firing vibration is suppressed.

Other advantages result from this arrangement of the gun, the excellent position of the pilot gunner, no more deviation produced by lateral wind (force *L* Fig. 3) and by the initial speed of the airplane (force *V*); this force *V* is transformed into a supplement of the initial speed of the ball.

1. The first application of the fixed gun firing above the propeller dates from the appearance of the Nieuport chasing biplanes (Fig. 4). This machine gun was placed above the top plane, and fired above the propeller. The principal inconvenience of this position, outside the great resistance to forward movement, was the difficulty of loading the arm. To reload the gun the pilot turned it upside down in *B*, and was then able to remove the discharged disk and replace it with a new one containing 47 cartridges. These 47 shells were quickly fired at the rate of three or four hundred per minute.

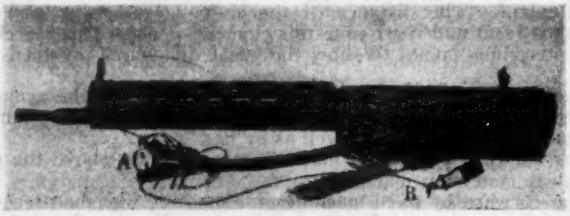


FIG. 12.—Fixed Maxim Machine Guns.

A, arrangement for synchronizing from the motor; *B*, grip of bowden control governing the fire. Weight 13.3 kilograms (29.26 pounds). With 500 cartridges and support 36 kg. (79.2 lbs.).

It is easy to fancy the difficulties encountered by the pilot, who not only had to drive his machine, but fire and reload his weapon. In fact, if the pilots of our first Nieuports did not obtain a decisive result with the first disk, they were obliged to stop fighting. The second application of the fixed machine gun was the shooting through the propeller, first practiced by Garros. At first thought the principle of this seems extremely curious. The gun was fired in the normal manner. To keep the balls from striking and breaking the blades of the propeller two plates of extremely hard steel were fitted onto the blades at the point where the balls passed (Fig. 5). The balls which hit these plates were deflected and lost, but the others passed betwen the blades and continued their course towards the objective. The percentage of balls lost was negligible, being less than seven or eight per cent.

But a latent defect soon brought about the abandonment of this arrangement; this was a loss of speed on the part of the airplane of 20 km. per hour (65,000 feet or over 12 miles). As a result of its transformation the propeller lost a part of its tractive force, a reduced efficiency resulting from the tapering at *A*, a reduction of the pitch of the propeller being made to compensate the resistance of the steel plates, and thus maintain the motor in its normal action (Fig. 5).

This technical superiority of armament could not compensate in a chasing airplane for the tactical inferiority proceeding from a lack of speed.

The third application of this formula was invented by the Germans at the time their Fokker chasing single-seater appeared (Fig. 6). The fixed

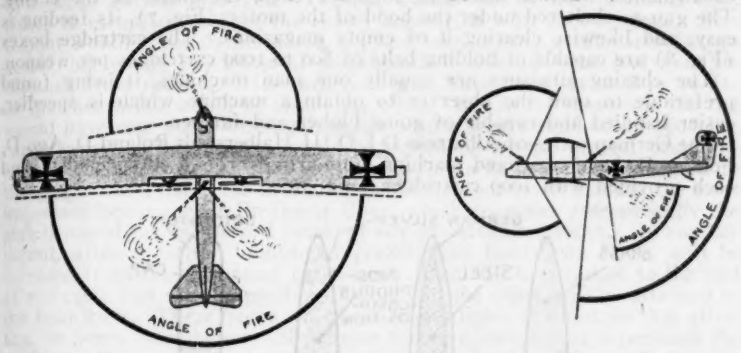
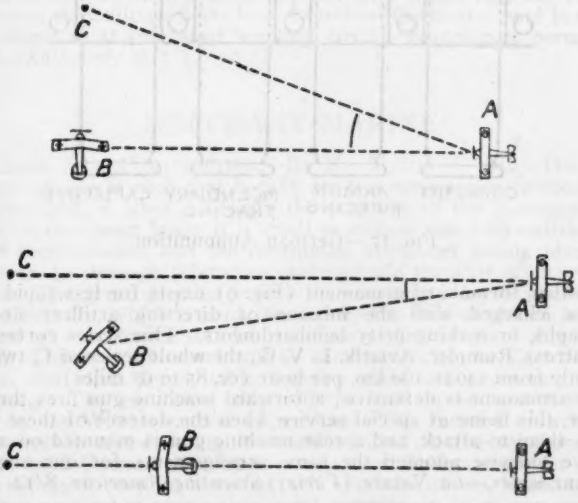


FIG. 13.—The Position of the Machine Guns, the Zones Under Fire with the 1916-1917 Gotha.

machine gun fires through the propeller, but it is governed by the motor, its action being synchronous with that of the motor. The propeller making 1400 revolutions per minute, and having two blades, it is obvious that the barrel of the gun is crossed by the blades 2800 times per minute, hence the



FIGS. 14, 15, 16.—The Direction of the Fire, Taking Into Account the Relative Displacement of the Enemy.

regulation of the firing must be sufficiently precise to permit the balls to pass in these intervals (a 46th of a second).

The control of the machine gun by the motor is effected by suitable gearing (Fokker, Albatross, D. Halberstadt, etc.), or by flexible transmis-

sion (Albatross, C. Rumpler C). The pilot operates his weapon at will by pressing on the grip of a Bowden control.

This application of firing through the propeller by synchronization of the machine gun with the motor is the arrangement adopted on the majority of airplanes, whether belonging to the French, the allies, or the enemy. The gun as sheltered under the hood of the motor (Fig. 7), its feeding is easy, and likewise clearing it of empty magazines. The cartridge boxes (Fig. 8) are capable of holding belts of 800 to 1000 cartridges per weapon.

The chasing airplanes are usually one man machines, it being found preferable to omit the observer to obtain a machine which is speedier, easier handled and capable of going higher and farther.

The German series of Albatross D I, D III, Halberstadt Roland D, Ago D, Fokker D, have two fixed machine guns firing through the propeller, and each provided with 1000 cartridges (Fig. 10).

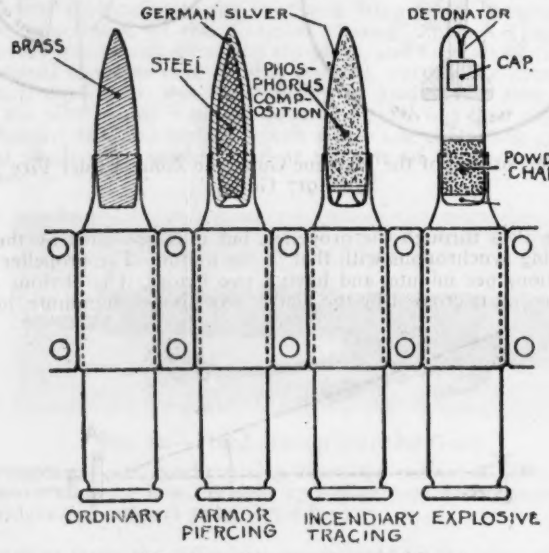


FIG. 17.—German Ammunition.

2. Another formula of armament (Fig. 9) exists for less rapid two-man airplanes, charged with the mission of directing artillery fire, taking photographs, or making petty bombardments. This series corresponds to the Albatross, Rumpler, Aviatik, L. V. G., the whole series of C, two-seaters, flying only from 140 to 160 km. per hour (cc. 85 to 97 miles).

Their armament is defensive; a forward machine gun fires through the propeller, this being of special service when the defence of these machines requires them to attack, and a rear machine gun is mounted on a tourelle. We have likewise adopted the same arrangements for our airplanes of equivalent series.—*La Nature (Paris), Scientific American*, 8/12.

SUBMARINES

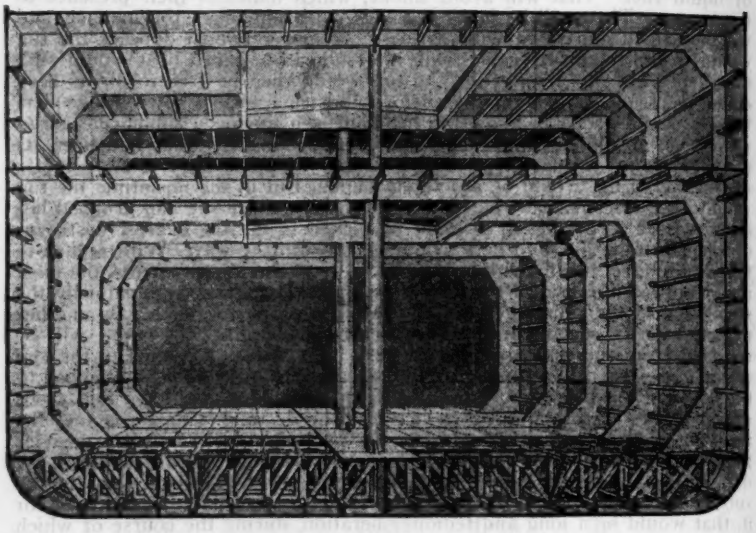
The Shipping Council of Great Britain is now considering a plan for the building of a number of towed submersible cargo carriers, which is backed by Prof. Vernon Boys, Prof. Hele-Shaw, and several leading shipbuilding firms and shipowners. The main idea is to have submarine cargo boats

that will be towed by tugs with their steam engines converted to the use of liquid fuel. That will avoid smoke, which indicates their presence to the enemy. They will be low-lying tugs, with not much top hamper, and will be armed and fitted with wireless. When a U-boat appears the tug would instantly slip its cable while the submarine cargo boat would sink to a depth already arranged. The tug would then be free to do its best, either to escape or to fight the enemy submarine with its own guns. The U-boat would probably know the tug had been towing a submarine cargo vessel, but would not know at what depth it was, or what had been its distance from the tug. Her torpedoes may have been set to 8 or 10 ft., so that her firing would be absolutely blind. But in the meantime the tug would have sent out a wireless message saying where she had dropped her cargo vessel. The message would be picked up by the nearest destroyer or aeroplane station, and help would soon be on the way. With regard to the cargo vessel itself, the inventors have taken out seven patents, the most important being one of Professor Boys, which regulates automatically the stabilizing of the submerged vessel at any pre-arranged depth. By another patent, after a certain number of prearranged hours two buoys will be released from the submarine cargo boat. One will be attached to the end of the cable that was dropped by the tug and the other will be attached to the boat itself. These buoys will show strong lights at night, so that after, say, 10 hours these buoys will indicate to the destroyers or aeroplanes the position of the dropped vessel. As the cargo boat will be much heavier than the U-boat, if the latter tries to search below the water for it the danger of a collision would be much greater to the enemy than to the submerged vessel. If the U-boat comes to the surface and tries to drag for it, that would be a long and tedious operation, during the course of which the enemy would probably be caught by destroyers or in danger of being spotted by aircraft carrying high explosive bombs. Some of the advantages claimed for the submarine cargo boats are its extreme simplicity and cheapness of construction, and the rapidity with which they can be turned out. Several shipbuilding firms have examined the matter, and have stated their readiness to at once start building directly government permission is obtained.—*Shipping*, 26/1.

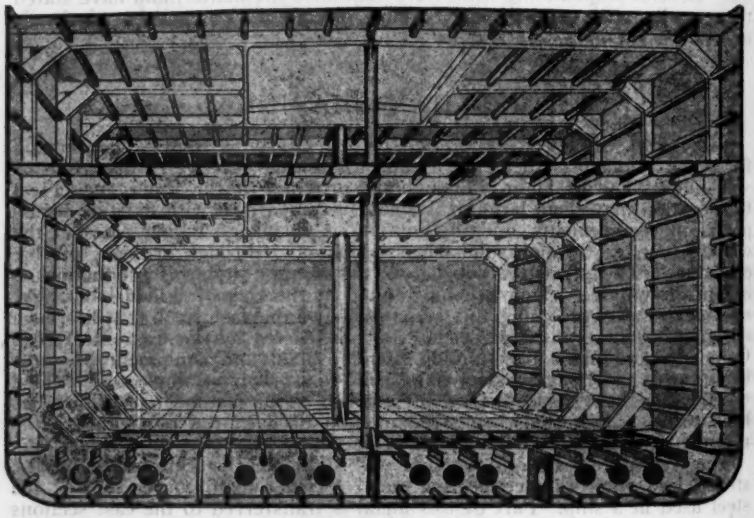
MERCHANT MARINE

CAST STEEL SHIP CONSTRUCTION.—By Mr. Myron F. Hill.—The demand for ocean tonnage is such that it calls for the most active co-operation of shipbuilders and of labor. Though the program of the Emergency Fleet Corporation may seem large, it is small in comparison with existing transportation requirements, and the continuous shrinkage taking place in the world's tonnage through submarine sinkings and through ordinary marine casualties. The great question before the country to-day is production or output of tonnage, which is being limited by the lack of skilled labor. As one means of overcoming this labor difficulty the cast steel ship has been designed. This type of vessel will be constructed by the Cast Steel Ship Company, and plans for suitable foundry plant and equipment are now being made. The cast steel ship will be cast in sections and welded together by the Wilson method of welding. This method of welding has been thoroughly tested, being the method used in the repairing of the recently owned German merchant vessels now in service under our flag.

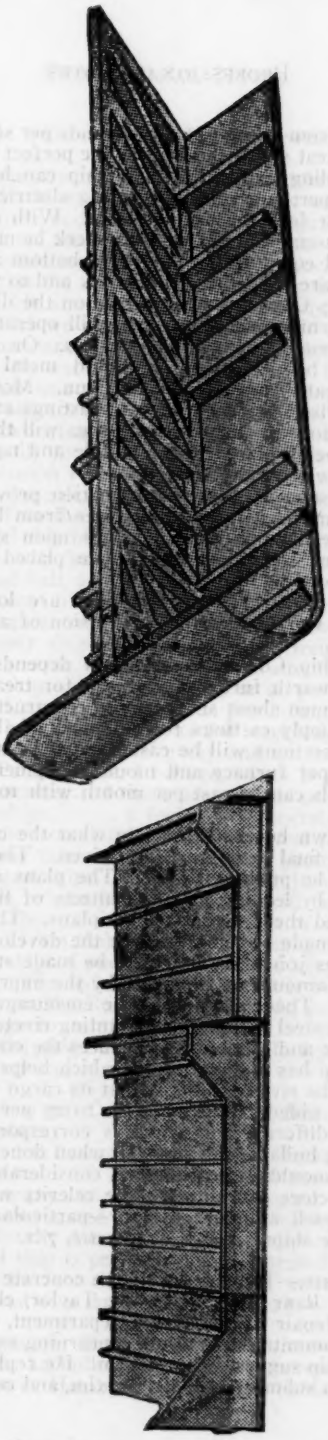
The welding of sections together will eliminate rivets, brackets, angles, straps, laps, and other connection metal forming 10 to 20 per cent of the steel used in a ship. Part of this metal is transferred to the cast sections to make them thick enough for casting for the thinner portions of the ship. Welded joints are planned for strength, and will be 50 per cent greater than plates to provide safety at joints. These joints, free from molecular action due to the mass strength of welded metal, will have approximately



SECTIONAL VIEW OF CAST STEEL SHIP.



SECTIONAL VIEW OF WELDED STEEL SHIP.



CAST STEEL SHIP SECTIONS TO BE WELDED INTO SHIP.

a tensile strength of from 62,000 to 64,000 pounds per square inch. Welding with an arc of fixed heat and speed insures the perfect adhesion of welding to castings. By welding automatically, a ship can be sectionally welded every week under expert supervision by using electrical equipment and by having unskilled labor feed the welding wire. With a regular yard crane outfit a ship can be assembled, and within a week be made ready for installation of engines and equipment. The inner bottom and decks and bulkheads of rolled steel are welded to framework and to the cast steel shell.

The Cast Steel Ship Company will operate on the division of labor principle. Under competent supervision gangs will operate through the shops, making mould after mould with proper devices. On completion of mould forms, pouring will be performed by liquid metal being conveyed on modern travelling cranes over forms and run. Moulds will then stand 24 hours, gates and risers knocked off, and castings extracted and cleaned. On account of variations in shrinkage, castings will thereafter be assorted, the largest castings being placed in the middle and tapered off to fit. The sections will then be electrically welded.

The Isherwood system of vessel construction proves ideal for casting. Ribs in two directions keep the castings free from buckling in handling. Castings provide overhanging ribs and lugs upon shell and framework, where the edges meet, so that castings when placed are forced together, bringing shell and overhang into position.

No scaffolding is necessary when castings are located, the automatic welders being set to work under the supervision of a few skilled practical men.

The Cast Steel Ship Company's program depends upon new foundry equipment, as open-hearth furnaces are used for treating the pig. It will take a gang of workmen about six weeks to construct one furnace. Three mould outfits will supply castings for practically half of a ship's length. The bow and stern sections will be cast from separate moulds. It is estimated that with proper furnace and mould equipment, about 500,000 tons of ship shells or hulls can be cast per month with 10 ways for assembling and launching.

The drawings shown herewith indicate what the company contemplates doing, although the final forms are not given. The final forms contain features which will be published later.* The plans of the cast steel ship have been reviewed by leading naval architects of this country who have warmly congratulated the designer on his plans. The success of the cast steel ship has been made possible through the development of the welding system which enables joints, as stated, to be made stronger than the shell itself at a minimum amount of labor and by the improvements made in the art of casting steel. These are due to the encouragement afforded by the railroads where cast steel is rapidly supplanting riveted structures, as it has proven more durable and reliable, and reduces the cost of maintenance.

The cast steel ship has a smooth hull, which helps to increase its speed, and is lighter than the riveted ship, so that its cargo capacity is augmented and its speed again aided. It is from 10 to 25 per cent stronger than a riveted ship in its different parts, and is correspondingly more durable. The cost of building hulls by this process, when done on a sufficiently large scale with machine moulding processes, is considerably reduced.

The two great factors of value are the celerity with which vessels can be built and the small amount of labor—particularly of skilled labor—required to complete ships.—*Nautical Gazette, 7/2.*

THE CONCRETE SHIP.—The success of the concrete ship must result from slow development. Rear Admiral D. W. Taylor, chief of the Bureau of Construction and Repair of the Navy Department, on January 21 before the House Naval Committee was asked concerning experiments with a non-sinkable concrete ship suggested by Maxim. He replied that several different devices had been submitted by Mr. Maxim, and certain tests and experi-

ments had been made which, he thought, were satisfactory to him. He further said:

"The question of the concrete-ship protection, when it first came to us, did not come from Mr. Maxim. Certain people abroad have given a great deal of investigation to it, and a great many investigations and experiments have been made, and we know their results. I do not believe that any experiment that we would make would add very much to the information, although not familiar at the moment with Mr. Maxim's last development of the concrete ship. He started out with an entirely different device, not involving concrete, which we tested on a small scale. On one plan of using concrete to protect merchant ships it is associated with building an extension or bay window on each side of the ship—a blister, the technical English name is. That was suggested a number of years ago, and some ships have had these blisters applied, and in addition we have found that if you put a foot or two of concrete on the original hull of the ship—the blister projects practically 10 feet out from the original hull—it is effective in preventing the explosion reaching the interior of the ship proper. The real difficulty with all these devices—there are any number of devices which can be applied to add to the protection of merchant ships—but the real difficulty in the case of this blister, for instance, is that it would not only reduce the speed materially, but it would require perhaps 20 per cent of the material of the original hull, and the effort to apply it to the merchant ship would be, say, 20 per cent of the effort involved in originally building the ship. . . . . Whenever these concrete people come to me I ask them: 'How does the weight of your ship compare with the weight on the ordinary system?' I have seen none who have looked into it carefully who will claim that a concrete ship will not weigh 15 or 20 per cent more than the ordinary type of vessel, and I have not seen any inventor who believes that the concrete ship can be built as light as the steel ship. There have been some small concrete ships built in Norway and an 80-foot tug. There is an enterprise on the Pacific coast, I believe, which is undertaking to build 5000-ton vessels of concrete, and there are various other people undertaking to build concrete ships. . . . . I feel if the concrete ship comes, it will have to come just as the iron ship came and the steel ship. The steel ships have been built by trying them out until we know pretty well now what we can do in strength of steel ships. It has never been just exactly determined, as in building a bridge, where you know what will be upon it. I believe the concrete ship will come, if it does come, step by step, advancing, say, from 80 to 120 feet and from that to 150, and so on. . . . . There is another factor in the concrete ship. Concrete has behaved very badly in a number of cases in sea water. The technical press has just been running a series of articles by a man from the Bureau of Standards, going particularly into the question of damage to reinforced concrete in sea water. We have had some troubles in the navy, at Boston particularly, with some piers we have built there."—*Army and Navy Register, 2/2.*

BRITISH EXPERIENCE WITH CORRUGATED STEEL SHIPS.—Consul General Skinner at London reports:

Considerable interest has been created in Great Britain in consequence of the recent public statement of Mr. Axel F. Ericsson, Chairman of the Ericsson Shipping Company and the Monitor Shipping Corporation, setting up the claim that the corrugated ships recently built by his concerns have proved to be extraordinarily successful in every respect.

The corrugated steel ship is produced from patented designs and is distinguished mainly by the fact that the necessary strength is obtained by deep corrugations instead of a structural framework.—*Official Bulletin, 9/1.*

FIRST GERMAN CONCRETE STEAMSHIP COMPLETED.—The first German freight motor vessel to be built entirely of reinforced concrete has just completed its trial trips at Hamburg. According to the *Fremdenblatt* it is

made of "a new kind of concrete which weighs only half as much as gravel concrete." The newspaper expresses the opinion that an epoch-making innovation in ship construction has been made by this new German invention, "which has a great future in the building of river boats, sea boats and large ships."—*N. Y. Herald*, 14/2.

"TORPEDO-PROOF" VESSEL PROPOSED BY HUDSON MAXIM.—Hudson Maxim, inventor, outlined to the Senate Ship Investigating Committee a scheme for ship construction which he said would minimize the effect on merchant vessels of explosion of torpedoes, by instantly disintegrating through a cooling process the gases formed by the explosions. He said he had sought in vain to interest the Emergency Fleet Corporation in his proposal and that he came to the committee in the hope that the government would conduct experiments to determine its worth.

His scheme, the inventor said, was to line the inside of the hulls of vessels with cylinders containing water with a steel screen behind them. When the torpedo exploded, the water tanks, he said, would be hurled against the screen, atomizing the water, which would disperse the heat and absorb the gases. A cargo such as apples, potatoes and similar produce containing a large percentage of water would serve just as effectively as the tanks, he said.

Mr. Maxim declared that the Ship Protection Executive Committee had made an "irrelevant and untrue" report on his scheme, asserting that it would be expensive and ineffective on vessels of less than 10,000 tons. He denied that the scheme would be costly and said it would operate on vessels of 3000 or 5000 tons practically as well as on larger vessels.

Concrete ships, the inventor said, offer a greater advantage in combating the submarine menace than steel or wooden vessels, as they give greater resistance and absorb heat better. A concrete hull, he said, would localize an explosion, and he strongly urged construction of concrete skins for steel vessels.

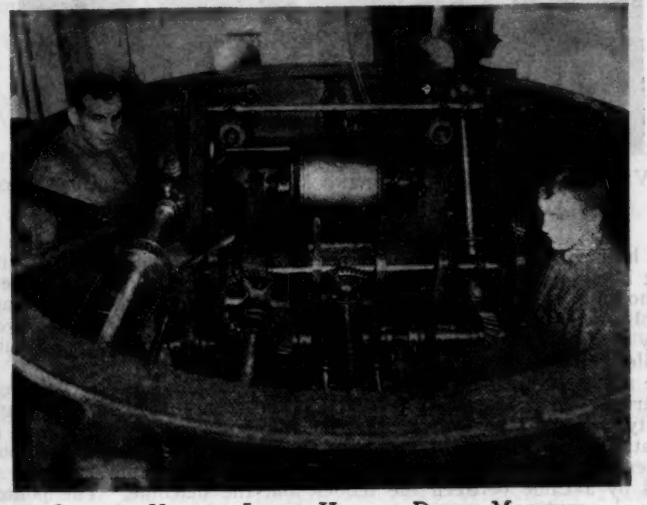
He said the nations fighting Germany either must stop the submarines from leaving their bases or build torpedo-proof vessels, as he did not think they should attempt to offset the submarine campaign by building new vessels.—*N. Y. Herald*, 17/1.

MISCELLANEOUS NOTES

DEEP SEA DIVING MACHINE PROGRESS.—Aside from other considerations, it is but natural to expect that the war with its attendant submarine and kindred activities has drawn attention to the hitherto limited scope of salvage operations where deep water sinkings are concerned, and has turned men's thoughts to the devising of means whereby present and past difficulties may be overcome and the sea be forced to yield back a moiety at least of the vessel treasure which is so ruthlessly, unceremoniously and continuously being committed to its keeping. Irrespective of the wonderful strides that have been made in the arts, crafts and manufactures during the past half century or less, it is a remarkable fact that in operations beneath the surface of the water, little progress is to be recorded. Vessels valuable in themselves and equally so as regards their cargoes strew the beds of the world's seas and of the Great Lakes of the North American continent

The method of raising ships employed to-day is familiar to most people, and it has been long enough operative to make them assume, if not believe, that it is the one and only way. In essence, it consists of a diver equipped with a rubber diving suit, copper helmet, and heavy leaden-soled shoes. Such an equipment makes it practically impossible for the man to work efficiently even in shallow water. Again, in depths greater than 300 feet the water pressure makes it impossible even for an individual of exceptional physique to do work of any kind.

REAR VIEW OF LOWER HALF OF DIVING MACHINE.



INTERIOR VIEW OF LOWER HALF OF DIVING MACHINE.

Spasmodic attempts have, of course, been made by inventors, scientists and engineers to overcome the inefficiency noted, but the limited nature of the sphere of application and the problematical value of the monetary returns, have contributed materially to restrict and confine effort to the preparation of nothing more tangible than designs and the filing of patents. Times have changed, however, as a result of enemy submarine activity; in a word, the old adage that "It's an ill wind that blows nobody good," is in process of being demonstrated, hence the appearance on the horizon of practicability, for the recovery of sunken ships, and such cargoes as are not destroyed by the action of sea water, as well as bullion, of the Sisson Deep Sea Diving Machine, by which name the apparatus is known.

The Sisson Deep Sea Diving Machine has been designed by W. D. Sisson of Alpena, Mich., and 115 Broadway, New York City, and consists of a hollow iron sphere 90 inches in diameter, within which are installed the necessary pumps, propellers and drills, the latter to perforate the sides of

SIDE VIEW OF LOWER HALF OF DIVING MACHINE SHOWING HULL DRILLING MECHANISM.

ships' hulls. There are also embraced a thrust arm with which to insert lifting hooks into the drilled holes and four electro magnets of some 2½ tons holding capacity, arranged to operate in pairs. The electro-magnet control admits of the diving machine creeping along the sides of a vessel to any desired location. An electric motor operates the various pumps, propellers, drills, etc.

The air supply system is arranged more or less on the lines adopted in submarines, an air tank being installed in the apparatus of two-men-supply capacity. Two propellers in the rear and bottom of the machine give navigation direction at will. Light is furnished by six 3000-candle power nitrogen lamps. Electric current and telephone communication are furnished by a cable between the tender and the machine. The pontoons employed as adjuncts are of corrugated steel, about 15 feet in diameter by 40 feet long.

Circumstances and location will, of course, determine many details of application and of the device in practice. In general, however, it may be

said that having ascertained the approximate location of a sunken vessel, the machine is lowered overboard from the tender, following which, by means of its propellers, search is made in the immediate vicinity for the exact position of the wreck and determination of its physical status. These preliminary problems having been satisfactorily solved, the pontoons are next lowered into position. Drilling of the hull for holes in which to insert the lifting-hooks is the next operation. The pontoon number and capacity will vary with the weight and dimensions of the vessel to be raised. However, it is hardly possible to imagine a case of possible salvage where the requisite pontoon number and capacity would be inapplicable. It should be stated here that the pontoons are water-filled when being submerged, the water being emptied out by internally-contained motor pumps when the actual raising is in process.

One diving unit is reported to be some 95 per cent complete at the company's shops and arrangements are in progress with a view to having it employed for the recovery of sunken vessels this coming spring. The views accompanying this article and the data given above have been supplied by the American Salvage Co., 115 Broadway, New York.—*Shipping*, 2/2.

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NAVAL WAR NOTES

PREPARED BY

LIEUTENANT W. B. JUPP, U. S. Navy

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STRATEGY

ALLIES AND U. S. BEGIN SUPREME WAR COUNCIL.—Great Britain, France, Italy and the United States were represented at the session of the supreme war council which was convened at Versailles, France, January 29, presided over by Georges Clemenceau, the French premier.

The meeting is regarded as one of extraordinary importance, because the plan of operations during the coming campaign is expected to come before it for determination.

The United States was represented by General Tasker H. Bliss, Chief of Staff of the American Army. Arthur Hugh Frazier, Secretary of the American Embassy at Paris, attended as a diplomatic officer, to report the proceedings, but not to participate otherwise. The other participants in the conference were:

For Great Britain: Premier Lloyd George and Major General Sir Henry Hughes Wilson, subchief of the British General Staff; for Italy: Premier Orlando, Baron Sonnino, the foreign minister, and General Cadorna; for France: Stephen Pichon, the foreign minister; General Ferdinand Foch, Chief of Staff of the Ministry of War, and General Maximo Weygand.—*Evening Star*, 29/1.

SHIPS POOLED TO HASTEN AID TO ALLIES.—*American, Allied, and Neutral Vessels Under Board of Three.*—Centralized control of transatlantic shipping was established recently with the creation of a Ship Control Committee to have supreme charge of the operation of all ships—American, allied and neutral—entering and leaving American ports.

The committee was named by representatives of the Shipping Board, the War and Navy Departments, the Food and Fuel Administrations, the Director-General of Railroads, the British Government and ship-owners, who met to devise some plan for speeding up the movement of supplies to Europe. It comprises P. A. S. Franklin, of the International Mercantile Marine, chairman; H. H. Raymond, head of the Clyde and Mallory Lines, and recently made Shipping Controller at New York, and Sir Connop Guthrie, director of British shipping in this country.

The arrangement, as explained by Shipping Board officials, in effect creates a pool of ships moving supplies to Europe. Goods destined for overseas will be loaded in available ships, whether operated by the United States or the allies. With the aid of the Railroad Administration the committee will divert to southern ports much of the supplies that heretofore have clogged the port of New York, and incoming vessels will be directed by wireless to proceed to the ports in which materials of the most importance await shipment.

The plan yet has to be approved by the British Government and by the other allies, but officials have received the assurance of Sir Connop Guthrie and Sir Richard Crawford, of the British Embassy, that this would be forthcoming.

Approval of the neutrals is not necessary, inasmuch as neutral ships operated by the United States and the Allies are operated under charter. The British long have urged an arrangement of the kind, and months ago sought to have the United States enter the inter-allied chartering conference. The centralized control now authorized virtually creates such a conference on this side of the water.

Shipping experts here have expressed the belief that at least 30 and perhaps 50 per cent greater efficiency could be obtained from the shipping at the disposal of the United States and its allies by close coordination of effort. Great Britain's shipping, it was stated, represented about 80 per cent of the overseas service.

In a general way, the British Government's shipping will be used to carry foods in quantities sufficient to meet the emergency conditions abroad. The United States will endeavor to get the men across and supply to them the necessary arms and ammunition.

The direction of all this tonnage, American and allied, will come under the jurisdiction of the council of which Mr. Franklin is the head. The War and Navy Departments and the Food and Railroad Administrations will not have representatives on the council, as it is intended to concentrate power for action in a small body. Agents of these departments, however, will work in the closest cooperation.

There will be representatives of the new council in all of the important American ports, and agents will be sent also to France, England, and Italy. By the use of the cables the men at the helm here will be kept in constant touch with all developments.

One of the first problems to be taken up will be quick routing of vessels, which often have been delayed for many days because of a division of power in their direction. Arrangements will be made so that ships will know in advance and definitely the place where the convoys are to meet them and the time they are expected to be on hand. Orders in this connection will be applied to American and allied ships and will be mandatory. It is said that there has been much confusion and delay in the past.

Incoming ships will be informed in advance also of the ports at which they are to land, thus doing away with the delays which have been caused by vessels arriving at docks already overworked. Outgoing vessels will be instructed where to get their bunker coal and cargoes.

Where it is found essential cargoes of foodstuffs may be sent over the transportation lines of the nation to southern instead of northern ports, and ships receiving directions from the new council will call at such ports when instructed, even if the overseas course thus allotted to them may be longer. The shipmaster will have no right to use his discretion in such matters under the proposed system of control.

In fact, it is intended to give to the Shipping Control Committee practically absolute power over the employment of tonnage, with the single proviso that there will be no effort in the direction of fixing rates for the allied as well as the American tonnage.

Activities will not be restricted to this side of the Atlantic, as much work will be done in the development of port facilities in Great Britain and France to provide for the rapid unloading and loading of vessels.

Mr. Franklin will spend most of his time in Washington and will keep in close touch with Edward F. Carry, director of operations of the Shipping Board and the various departments involved. Mr. Raymond will establish headquarters in this city.

Raymond B. Stevens, vice-chairman of the Shipping Board, and George Rublee, of the board's legal staff, are to be sent to London as permanent representatives of the Shipping Board.

Mr. Stevens will take his place on the Inter-Allied Chartering Executive, which sits at London and Paris and has control over all British, French, Italian and neutral tonnage operating under charter to the Allies.

The Shipping Board is understood to have under consideration several shipping men for the posts of representatives of the Division of Operations at London, Paris, and Rome.

Robert P. Bass, former governor of New Hampshire, and a labor expert, who has been assisting Mr. Stevens in dealing with labor problems, will take over such of the vice-chairman's duties as have to do with labor, it was learned. Whether one of the four remaining commissioners will be appointed acting vice-chairman during Mr. Stevens's absence could not be ascertained.—*Nautical Gazette*, 1/2.

ALLEGED SUCCESS OF CONVOY SYSTEM.—The *Pall Mall Gazette* recently published an interview with Sir L. Chiozza Money, Parliamentary Secretary to the Minister of Shipping, on the question of ships and food.

Referring to the effects of the U-boats, Sir Leo remarked that the rate of our losses had fallen so greatly since the spring of 1917 that it is quite certain the enemy cannot beat us or starve us by a submarine campaign.

Regarding the convoy system, he said the public hear only of quite exceptional cases of loss without knowing what excellent results have been achieved. As regards homeward convoys, I have here a list of 186 homeward convoys, concerned with no fewer than 2430 ships, carrying no less than 17,500,000 tons of cargo. And what was the loss on the whole? Almost exactly 1½ per cent.

As to food ships, so well have they been cared for that the recent losses, including the exceptional cases to which public attention has been directed, have been exceedingly small. In the last few months, for example, scarcely any of the wheat homeward bound to the United Kingdom has been lost by enemy action. But no one, added Sir Leo, should find excuse for waste in that statement, for, as has been said, the cumulative effect of past losses remains. Further, we have, unfortunately, had to divert food cargoes from the United Kingdom, France, and Italy.

If, therefore, I tell you, added Sir Leo, that the convoy system has been a magnificent success, I say no more than the truth, but that success does not put us back to the position we occupied before the serious losses began. Only new building by Britain and the United States can do that, and it will be some time before that building tells and raises the aggregate tonnage position of the Allies.

Commenting in its issue of January 14 on the above interview, the Liverpool *Journal of Commerce* comes to the conclusion that Sir Leo's figures are misleading. In part it says as follows:

A week ago Sir Leo Money is reported by the *Pall Mall Gazette* as saying:

"The public hear only of quite exceptional cases of loss without knowing what excellent results have been achieved. As regards homeward convoys, I have here a list of 186 convoys concerned with no fewer than 2430 ships carrying no less than 17,500,000 tons of cargo. And what was the loss on the whole? Almost exactly 1½ per cent."

Observe the "no fewer" and the "no less," for we are inclined to the opinion that Sir Leo indulges in exaggeration when he wishes to appall

us by the immensity of the figures with which he dabbles. A week later he is reported by the *Daily Mail* as saying:

"Or consider the success of the convoys. The last report which has just reached me shows that over 18,000,000 tons deadweight have been convoyed with a loss of only 1.52 per cent. Or, take all inward cargoes. In the last four months the loss has been only about 3 per cent, of which only about 1 per cent is represented by food."

Sir Leo Money does not state that "the list" quoted in the *Pall Mall Gazette* is one and the same as the "last report" quoted in the *Daily Mail*. However, he speaks of 2430 ships carrying 17,500,000 tons of cargo, which he works out at 7200 tons per ship, and if he is sincere in his utterances he would speak of an average convoy of average ships, with the average deadweight capacity of 7200 tons. If we apply such figures to all inward cargoes in the last four months we find there is something wrong, else our figuring is not what it should be. During September, October, November, and December, there were 43,438 arrivals at British ports, according to the weekly returns issued by the Admiralty, and on an average carrying capacity of 7200 tons we have a total of 312,753,600 tons brought to this country. Obviously, this is wrong. Its ridiculousness is apparent on the face of it, and at the same time Sir Leo's own figures help to disprove it. He says "the loss has been only about 3 per cent," which represents 9,382,608 tons, or 1303 vessels. Yet the total of sinkings, out of arrivals and sailings, reported by the Admiralty in the same period is 311 vessels, of which 222 were 1600 tons gross and over, and 89 under 1600 tons. There is something wrong.

Again, he says 2430 vessels were convoyed with a loss of only 1½ per cent, that is, 36 vessels. (Again we say we do not know whether "the list" quoted in the *Pall Mall Gazette* is one and the same as the "last report" quoted in the *Daily Mail*.) A simple proportion arithmetic calculation tells us that if 36 vessels are sunk out of 2430, then proportionately 644 would be sunk out of the 43,438 arrivals during the last four months. But we are officially advised that there were only 311, and the deduction we draw from Sir Leo Money's illustration is that the proportion of sinkings is exceedingly high in the convoys. If 311 is the total sinkings, then proportionately only 18 should have been lost out of his convoys.—*Nautical Gazette*, 7/2.

THE WAR AT SEA.—The following is the first sentence of a leading article in the *Army and Navy Journal* of New York for December 8, 1917:

"From statements made by the navy authorities of France, England and the United States in the last few days it would appear that the long-looked-for more aggressive naval policy on the part of the Allies was in sight."

It has long been apparent to those who read the American professional journals and the expressions of opinion which have appeared from time to time in other American papers that the view was held very generally on the other side of the Atlantic that the naval policy of the Allies was susceptible to improvement. While praise was lavished on the officers and men of the British Navy and its auxiliaries afloat for their gallantry, endurance and technical skill, it was suggested that while the fleet was under the control of politicians suddenly called upon to face the problems of war in a serious way and insufficiently equipped for the purpose, it was unlikely that the very best use would be made of it. The United States, like this country, describes its navy as its first line of defence, but it has learned also the potency of its fleet as an offensive weapon. Like this country before the war, it possessed only a small but highly trained professional army, which on occasion it had used as the spearpoint of its naval forces. Although, then, when the United States came into the war, measures were taken to increase the land forces, it was to the navy that the nation looked primarily to assert its strength on the side of the Allies. Mr. Daniels, the Secretary of the Navy, in his annual report recited the steps taken by his department to cooperate with the fleets of the Allies,

and described the frank and free interchange of information which in the conduct of the naval war was a proof of "the partnership of democratic nations which will yet ensure a lasting peace."

The decision to create an Allied Council composed of the high naval officers of all the allied powers has been regarded as a significant sign of a change in policy more in accordance with this American view. This belief was held to have support in the statement made by Mr. Daniels on December 5 that "there is to be the greatest possible measure of cooperation between the American and allied navies. The plan is to get the highest degree of efficiency out of our naval forces wherever they may be needed." It has been admitted by the changes which have been made during the past year that a weak place in our Admiralty organization was the Operations Department, and among the measures which have been taken to strengthen this department Sir Eric Geddes has mentioned an infusion of younger officers with recent experience afloat. If, then, the *Army and Navy Journal* is justified of its surmise, the new policy will have as its sponsors not only the French and American professional writers who have pressed for it, but the young British naval officers with war experience, whose opinions after all must appeal more strongly to their countrymen.

It is not proposed to speculate here as to the form and substance which this more aggressive policy will take. Commenting on the appointment of Sir Rosslyn Wemyss, the *Times* said "our younger seamen are convinced that they can entirely overcome the submarine peril if they receive the free hand which they have never yet been granted," and the *Daily Mail* said of the new First Sea Lord that "his record suggests that young and energetic officers will find a more open path to promotion and greater opportunity of making good than was ever the case under the old régime." Obviously, there is here pointed out one direction in which offensive policy may make itself manifest. The *Westminster Gazette* also on this point says, "the younger school will be well advised if, with the experience of their predecessors behind them, they refrain from making promises and restrain their sponsors from promising on their behalf. What their plans are they will rightly keep to themselves, but their main defensive task is still to grapple with the submarine and to bring all their wits to bear upon mastering as well as holding that peril." On the other hand, the American *Journal*, which has been already quoted, looks further afield. We are told, "opinions have been advanced in Washington that the logical developments of the formation of the naval council are that either the American naval forces abroad will be sent to the Adriatic to join in a combined attack on the navy and naval bases of Austria, or that the Naval Council will control the merchant fleet of the Allies, and to our ships will be entrusted the entire task of convoying them." This is the kind of speculation which British writers and publicists are not prone to indulge in. It can serve no good purpose. More to the point it is to say that there is no likelihood whatever of "a younger British school," or the allied naval authorities conjointly, undertaking any risky adventures or ill-conceived "gambles," because our naval forces have now been reinforced by those of the United States.

That the strategy of a naval offensive can be pushed without incurring risks is absurd, and if there are any who believe that Admiralty reconstruction is going to prevent entirely mishaps, such as that to the three destroyers, or an occasional successful attack by the enemy on a convoy, they will assuredly be disillusioned before long. The public should bear in mind that not every German adventure turns out a success, and it is silly to describe every British mishap as a disaster or a catastrophe.—*Army and Navy Gazette*, 5/1.

CHIEF OF STAFF WILL REPRESENT ARMY ON SUPREME WAR COUNCIL.—General Tasker H. Bliss, chief of staff, who arrived in Paris to-day, will represent the United States Army on the Supreme War Council. Secre-

tary Baker in so announcing disclosed that the general is accompanied by high officers of every branch of the service to advise him about any question that may arise.

General Bliss attended the first meeting of the council and decision to send him back to Europe as a permanent representative in that body was made because it was recognized that General Pershing's duties in organizing and commanding the ever-increasing American Expeditionary Forces were too great to permit him to undertake the presentation of American views on military operations and to sit with the council in framing plans of strategy that cover all fronts and all armies.

No word of the departure of General Bliss had been published until the news of his safe arrival came.

From General Bliss the War Council will obtain an up-to-the-minute report on what the United States will be able to contribute to operations on the western front this spring and summer. His report in this regard has been forecast to some extent by President Wilson's statement to Congressional visitors that there would be in Europe in June twice the number of American troops which it had been originally planned to send by that time.

General Bliss also can inform his conferees exactly the situation in which the United States finds itself now as to delivery of supplies of all sorts to the Allies, and this information probably will have great weight in the shaping of war plans.

While Secretary Baker's statement merely said that General Bliss had arrived in France to represent the army on the council, there have been intimations that renewed recommendations for vigorous offensive operations on the widest possible scale were included in the instructions the general received before sailing.

Probably the primary consideration before the council when it reconvenes will be the widely advertised proposed German offensive on the western front. A mass of information has reached the allied powers from many quarters indicating an impending drive against the British or French lines, or both, which will be carefully reviewed.

The possibility suggested by Colonel Repington, the British military critic, in his initial article in the *London Post* to-day that the "German concentration may be to support negotiations" rather than for an assault is in line with views held by some American officers here. They feel that had Germany really intended to make a great drive she would not have given advance notice of it and are inclined to the opinion that the German high command is endeavoring to set up the bogy of a great attack as a preliminary to another peace drive.—*Baltimore American*, 24/1.

MINES PLAYING BIG PART IN WAR AT SEA.—*Hunting and Dragging Bring Wireless and Aircraft Into Service.—How Germans Lay Them.*—With the exception of the few general naval engagements which took place early in the war, sea warfare has consisted almost entirely of submarine attack and defence, along with mine laying and mine dragging. The warfare of mines has developed enormously during the last year, until its importance almost equals that of submarine warfare. At present it is a race to determine whether the Allies can drag the mines faster than the Germans can manufacture and lay them. Usually the Allies are able to keep the sea lanes clear, and sometimes the Germans manage to plant their mines in a position to keep several sea lanes blocked.

Almost invariably the Germans lay their mines from shallow draft minelaying submarines, that carry but a few torpedoes, besides their eight or a dozen mines. These minelayers operate under cover of darkness, laying a string of heavily charged mines diagonally across the channels, often forming a double barrier to the sea route. Besides mining the channels at the entrance to important ports, the minelayers sow their charges off the coast along routes usually taken by convoys.

The Germans have concentrated their minelaying in a few regions—Saloniki, Malta, where one British officer dragged more than 200 mines; certain Italian ports; a few parts of the English Channel, the southern Irish sea, the eastern English coast and the Atlantic ports of France.

Before dragging the mines they must be located. This is done by means of a complete series of reports from all kinds of air and sea craft. Seaplanes, airplanes and scout dirigibles explore the channels and sea lanes whenever atmospheric conditions permit and especially ahead of each convoy. And to this group has been recently added the captive balloon, towed by a patrol boat. Hundreds of mine fields have been located by these means.

The aircraft, when a ship is running toward a newly discovered uncharted mine field, drop messages attached to cylindrical floats, which are picked up by the ships. However, especially at this season, the weather is prohibitive of good aerial patrol work.

Sometimes mine fields are discovered in ways that thrill. Several patrollers have seen mines at low tide in the trough of an extra large wave. And the patroller crews know enough of the mine's possibilities to fear it. Another costly but sure indication of the presence of a mine field is the blowing up of a ship. Often this is the first warning that the enemy has passed that way.

By wireless from the aircraft and the sea patrollers; by semaphore from the coast defence stations and by the detailed reports of each vessel that touches port, the locations of the mine fields are forwarded to the staffs of the different navies. Regularly published maps spread the news broadcast to warn all ships until the mines can be dragged and the dangerous channels and sea lanes once more thrown open to navigation.

Channel dragging is comparatively simple, because the space to be cleared is well defined and the proper moment can be chosen. Conditions of tide, wind and fog are not so important.

Off shore dragging, on the other hand, is very difficult for many reasons. In the first place, the exact location of the mine field is rarely known, hence an enormous area must be dragged in order to be sure that all the mines have been discovered. Sometimes aerial observers have seen "moons" and have reported them for mines. "Moons" are large round fish that have caused a lot of fruitless dragging.

Once the definite location of the mine field is known, the dragging can proceed quite accurately and rapidly by obtaining two points on shore. This is usually possible, since the mines are rarely laid in over 75 fathoms of water. Foggy weather obscures the landmarks and prevents dragging.

If the wind is high and a heavy sea is running it is impossible to drag, partly because of the danger of dropping on a mine in the trough of a sea and partly because of the impossibility of exploding or sinking the mines when the shears cut them loose. A drifting mine is a menace to friendly and enemy ships alike.

Conditions of the tide must likewise be considered for the angle given the mine cable; a strong tide would oblique the cable and hinder dragging.

Once at sea the Germans cannot touch their mines, because they are stored in compartments, opening at the bottom of the submarine. A pin is pulled out when over the channel or route to be mined and the mine falls of its own weight. When the mine hits the ocean floor the cable is released and the anchor, usually of the mushroom type, grips the bottom. The mine rises to the surface until a hydrostatic valve stops the unrolling of the cable. The desired distance is about 12 feet below the surface of the water.

Often the Germans make mistakes in setting the hydrostatic valves. Air pressure is considered, but this changes between the time the minelayer leaves port and arrives over the area to be mined. Also, if the mines are dropped in a fast tide, they rise in an oblique line until the valve stops them when at the desired depth. Later, at slack water, the mines rise very near, or even to, the surface, where they are readily seen.

In the near future I hope to see some mines cut loose from their cables; to see them jump partly out of water; to see a well directed rifle shot from the little yacht break one of the four antennae surmounting a mine, thus causing the upheaving cataclysm following the explosion of 310 pounds of trinitrotoluol.—*Evening Star*, 28/1.

BLAMES VON TIRPITZ FOR U-BOAT FAILURE.—An article attacking the submarine warfare, which was suppressed by the German censor last October, has now been published "with the sanction of War Minister Von Stein" by the *Kiel Zeitung*. The article was written by Dr. Struve, a progressive member of the Reichstag, who asserts that the submarine war is a failure, and discusses at considerable length "who was responsible for the unrestricted submarine warfare agitation and for the statement that England could be forced to her knees within six months."

Dr. Struve asserts, after quoting a variety of witnesses, that the whole agitation was conducted and engineered by Admiral von Tirpitz after the latter's retirement. The article then develops into an attack on von Tirpitz and the new Fatherland Party for "getting Germany into this difficulty," and closes with the assertion that the submarine warfare might have been a success except for the fact that von Tirpitz, while in office, had neglected to build submarines in sufficient numbers to insure success.

"That was the reason," adds the writer, "that unrestricted submarine warfare was always opposed by von Capelle, Minister of the Navy, and the Imperial Chancellor, von Bethmann-Hollweg."—*Evening Star*, 9/2.

THE PROPOSED U-BOAT DRIVE.—Neither the Allies nor the United States are deceiving themselves as to the U-boat situation. And the United States knows well that it may expect this present year a drive of the submersibles against the Mexican coast points, for once it is seen that the war must be carried into the breakdown of Germany—that country will make a desperate effort to have the United States pay the cost of its entrance into the strife as heavily as possible.

Such is the outlook for the coming months. And the government, with its patrols and its nets and other measures will be quick and alert to offset the plans of the Germans and to frustrate their raiders. At any rate, the fact remains that the menace of a tremendous drive of the submersibles on this side the water, as well as the other, is apprehended. The most momentous drive on land and seas that the world has ever seen in military and naval action is the standard of probability that the United States' military authorities, in combination with those of its friends abroad, are taking as the standard of full preparation.

Either peace or the worst chapter yet of the war is the outlook—who can doubt which.—*Baltimore American*, 29/1.

LESSONS OF THE WAR

THE UNARMORED BATTLESHIP.—*Tendency is Toward High Speed, Great Gun Power, and Large Displacement.* By Commander Yates Stirling, Jr., U. S. Navy.—Until quite recently, the evolution of the battleship was based almost solely on the power of the gun, for the danger of the torpedo from a surface craft was being discounted. Battleships strove to carry sufficient thickness of armor to prevent shell penetration. Those nations who built their battleships with internal underwater armor reckoned only with a moderately heavy torpedo war head. That such underwater protection is wholly inadequate can be readily understood when it is remembered that a torpedo war head is now used which contains nearly 500 pounds of the highest explosive known. This is nearly double what was used at the commencement of the war.

The present-day battleships or the superdreadnoughts, as they are called, are fairly adequately protected from gun fire by their great weight of armor.

The maximum speed of the battleships is but little greater than that of the latest submarines. A battleship requires probably more than half an hour to go from its cruising speed to its maximum, while a submarine can be going at its highest available surface speed within a few minutes. A submarine can sight a battleship at a distance of about 25,000 yards or 12½ miles. A battleship can recognize a submarine in the awash condition at no greater distance than 5000 yards or 2½ miles. A submarine, on sighting an enemy ship, would immediately sink to as near the water as possible, in order to avoid detection, for a submarine, when silhouetted against the sky, can be recognized a long distance away.

If the battleship's course heads through the tactical area of the submarine, there is almost the certainty of destruction involved for the big ship, unless it is accompanied by numerous anti-submarine craft.

The control of the surface of the sea is an important factor in the command of the sea. To control the surface, gun power, coupled with high speed, is essential. To gain high speed, retaining gun power at a maximum, armor must be sacrificed. The evolution of the dreadnought battleship of 21 knots speed was shaken to its foundation when the submarine reached its present state of offensive development. England and Germany both realized this shortcoming in speed when they laid down, respectively, the *Queen Elizabeth* of 25 knots and the *Ersatz Kaiser Friedrich* of 23 knots. Although data is not available, armor protection was probably sacrificed for the added speed. Each nation aimed at the control of the surface.

The logical development of the *dreadnought* battleship is towards the maximum number of the largest caliber guns with the highest speed attainable on the displacement permitted by other circumstances. The *cruiser* development seems to be toward guns of larger caliber than that carried by a contemporary battleship and with higher speed for the purpose of outranging the battleship. The battleship probably will retain some armor, but when it finds itself outranged by its enemy and without the speed to force a closer action, it too must eventually sacrifice all armor for gun power and speed. Thus, the development of these two types, the dreadnought and battle-cruiser, appears to be toward an amalgamation.

From the very nature of the problem of defence of our shores we require a type in which must be combined great gun power, large cruising radius and high speed. We should be able to hold possession of our own waters. It does not suffice for our fleet to meet an enemy on or near our coast line; we must meet him beyond in order that our peace lines of communication may remain unmolested. This principle holds for every type of warship.

Barring England and Mexico, an attack upon the United States, in its initial stages, must be conducted in many vessels across many miles of sea. In the event of war, therefore, with an enemy across the sea, our first duty will be to gain touch with his attacking expedition as far from our coast as possible and convenient in order to harass and eventually annihilate it. Slow battleships seem to have no place in our "attacking" fleet. We should have types capable of "controlling the surface" from our shores to the advancing enemy. By this means we shall lessen, if not eliminate, the danger of enemy submarines, and give our own mobile offensive type of submarines an added value. Gun power, radius of action, and speed are essential for this work. These are the pivotal attributes. To gain them, all purely defensive attributes will have to be sacrificed.

Every nation must eventually reach a maximum limit of displacement, which it would be ruinous financially to go beyond. In our case this limit is for all times fixed by the size of the Panama Canal locks. These locks have the following dimensions:

Length	1,000 feet
Width	110 feet
Depth	40 feet

This most important passage, enabling us to concentrate a fleet in either ocean, can pass in safety a vessel with the following maximum dimensions:

Length	950 feet
Beam	100 feet
Draft	36 feet

"You cannot have anything for nothing," is a truth that the naval constructor and designer of warships never ceases to expound to the sea officers who seem to want thick armor, great gun power, and high speed on a moderate displacement. There must be sacrifices. The least important must feel the knife.

If great speed is desired while retaining maximum gun power, radius of action, and armor protection, we must send the displacement to illimitable heights. The figures in table No. 1 are authentic and sufficiently accurate.

If, on the other hand, we thin down the armor to what has been termed by naval architects the "Safest minimum," we have the figures given in table No. 2.

From the figures in the tables a comparison of the two largest ships capable of passing through the Panama Canal would appear instructive. With maximum armor we can build a vessel of 45,000 tons of 26 knots speed; with safest minimum armor, one of 39,500 tons of 29 knots speed. Gun power has been taken as equal; that is each is armed with twelve 14-inch guns. The two vessels having the same caliber of guns must fight at a range within the capabilities of that caliber. At the range which must be chosen the 8 inches of armor carried by the faster ship will not furnish adequate protection. It is, therefore, weight wasted, which should have been put into a larger caliber of gun to enable the faster and more lightly protected ship to outrange the slower.

The warship of highest speed with guns outranging any vessel afloat need carry no side armor for protection against the gun. Even the number of guns carried is unimportant except to shorten the time required to destroy an enemy. Once a vessel embodying this idea is built, a similar but faster and stronger vessel in a rival's fleet will appear. Thus, we shall see the old course of evolution repeated in a new cycle.—*Scientific American.*

THE DESTROYER AND THE TORPEDO.—*High Speed and Quick Turning Ability the Effective Answer to the Torpedo.*—The torpedo is not, in the military sense, nearly so important a weapon of offence as it is popularly supposed to be. We say "in a military sense"; for the enormous destruction of unarmed and helpless merchant shipping which the Germans have accomplished, is not a military operation, but mere outlawed piracy. If Germany had obeyed those humanitarian laws of war, which are the outgrowth of many centuries of endeavor to protect the non-combatant from the cruelties and losses of war, there would have been a comparatively small toll of sunken ships to their credit.

All through the history of the development of torpedo warfare, the inventors, in their plans and specifications have shown that they were trying to devise some means of sinking warships, unseen by the enemy. Bushnell, Fulton, and Holland in this country, to say nothing of the French and Italian inventors, carried in their minds as the object of attack only the warship. The merchant ship, they well knew, was recognized, in the universal opinion of civilized nations, as exempt from torpedo attack.

To Germany belongs, and will forever belong, the distinction of being the first naval power to break away from those safeguards of human life which have the sanction of centuries behind them, and divert the torpedo from its legitimate work as a weapon of war, and use it as an instrument for the wholesale murder of passengers and sailors upon the high seas.

So having now disabused our minds of any undue appreciation of the torpedo, drawn from its misuse against helpless and unarmed ships, we shall be prepared to recognize the surprising fact that against swift and well-

guarded warships, the torpedo has shown itself, in the present war, to be a surprisingly ineffectual weapon. Thus, in the battle off the mouth of the Elbe, lasting several hours, in which some 50 to 60 ships, all heavily armed with torpedoes and using them very freely, were engaged, not a single torpedo hit, if we remember rightly, was reported on either side. Even more significant is it that in the great battle of Jutland, in which over 120 ships were engaged, and the destroyer flotillas were exceedingly active, only one torpedo hit was made on the whole of the British fleet, which must have included at least 70 to 80 vessels of every type. The battleship *Marlborough* was struck near the stern and listed rather heavily; but she was able to bring herself back to a level keel and continued the fight.

High speed and quick turning power have proved to be the best defence against the torpedo. The fast battle-cruisers and scouts are well able to take care of themselves and the slower battleships are protected by numerous screens of destroyers, each flotilla being led by a fast light cruiser, carrying heavy torpedo defence guns, of from 4- to 6-inch caliber.

The failure of the torpedo to get in very much effective work against naval vessels is not due to the inefficiency of the torpedo itself; for the torpedo is indeed a wonderfully efficient weapon. It is stated that our latest 21-inch superheat torpedo will travel with marvelous accuracy for 10,000 yards at a speed of between 30 and 40 knots. Target practice with these weapons, in time of peace, has proved that it will do this consistently; but target practice conditions, when the target is stationary or moving at a comparatively slow speed, and conditions in a sea fight, when the enemy's ships are moving at from 20 to 35 knots, are two very different propositions.

The failure of the torpedo against warships is not due to the weapon, but to the human element—the great difficulty of estimating the distance, speed, and course of the enemy's ship. This is so far recognized in battleship tactics, that no attempt is made to fire the underwater torpedo tube of a battleship against the individual battleships of the enemy's column. The torpedoes, should the two fleets come within torpedo range, say 10,000 yards or less, would be discharged against the enemy's line as a whole, on the chance that while many of the torpedoes would pass between the ships, others would score a hit. The modern warship is about 200 yards long and the interval between the ships is about 500 yards, if they are keeping proper station, so that theoretically two out of seven torpedoes should hit the mark.

It is extremely difficult to hit a fast ship at a distance of 5000 to 10,000 yards. Thus, a 700-foot battle-cruiser going 30 knots will cover a distance equal to her own length in 14 seconds, whereas it will take a torpedo of the latest design at least eight minutes to reach a ship 10,000 yards away. Now a 30-knot ship, moves at the rate of 50 feet per second, and hence it is necessary for the torpedo officer to estimate very closely the distance of the ship and the speed at which she is traveling, before he can determine how far ahead of the position of the ship he must aim his torpedo if ship and torpedo are to meet some minutes later. If he estimates the ship is traveling 30 knots, when she is traveling only 25, and calculates the course of his torpedo accordingly, the torpedo will reach the proposed meeting point too soon and will pass ahead of the ship. Vice versa, if he estimates she is traveling 25 knots when she is really going 30, his torpedo will arrive too late and will pass astern of the ship.

How difficult these calculations are is proved even in the attack by submarines at close range on slow-speed merchantmen; for many times during the past two years it has been recorded by the officers and crew of such ships that torpedoes have passed ahead or astern of them.

In spite of its visibility, the 30- to 35-knot destroyer, carrying from 8 to 12 torpedo tubes, is the most effective means for torpedo attack. The work is hazardous, of course, but several flotillas of these craft, rushing down upon the enemy at 35 knots, particularly if they are protected by a smoke screen, are very likely to get a battleship or two, even though several of them are disabled or sunk by gun fire.

The smoke-screen or smoke attack, which has been used so frequently and effectively in this war, originated in the United States Navy, being first used in our destroyer fleet, when it was under the command of Captain Eberle. The writer well remembers being present at such an attack off Block Island several years ago, when five groups of destroyers, 20 in all, crossed the head of a column of battleships, until they were in the windward position, and then, with the leading destroyers smoking heavily, swept down the line of the enemy at a distance of about 1300 yards. The pall of dense smoke rolled down to leeward, enveloping the enemy and screening the destroyers from observation; but above the dense and low-lying bank of smoke could be seen the successive pairs of fighting tops of the battleships; and, had the maneuver been an actual battle, some of the capital ships would have been heavily torpedoed.

In the battle of Jutland, the German destroyers made use of this smoke-screen as a protection to their own battleships, when they were being heavily hit by the battleship divisions under Admiral Jellicoe. A noticeable feature of that fight was the use of fast 30- to 35-knot light cruisers, armed with 6-inch guns, as leaders of the destroyer flotillas. One well-placed shot from a 6-inch gun will usually cripple a destroyer, if indeed it does not sink her, and the object of these light cruisers is to lead the attack, break up the counter-attack of the enemy, and bring her own destroyers within torpedo range.—*Scientific American.*

PRESIDENT WILSON ON THE FREEDOM OF THE SEAS.—In the course of his masterly address before the House and Senate, setting forth the fourteen terms of peace for which we are "willing to fight until they are achieved," President Wilson stated that the United States stands for "absolute freedom of navigation upon the seas, outside territorial waters, alike in peace and war, except as the seas may be closed in whole or in part by international action for the enforcement of international covenants."

Now, this, the true freedom of the seas, is a very different matter from the freedom of the seas which Germany is seeking to bring about.

We stated in our editorial upon this subject, last week, that Germany has never given any clear statement of what she intended by the phrase; and it is certain that no formal definition has ever been made by the German Government.

But although the government, for obvious reasons, has been silent, one of Germany's leading naval and military critics, Count Reventlow, has declared his interpretation of the phrase in terms which remove the last vestige of doubt as to what he and, it is reasonable to suppose, the German Government has in mind. For Prof. Selfton Delmer, who was present at a mass meeting in Berlin last March, when the Count lectured on war aims, has recently supplied the *Daily Mail* with a translation of certain passages from the address, which leave no further doubt as to the manner in which Germany interprets the "freedom of the seas."

Attention is drawn to this translation in an article contributed to the *Naval and Military Record* by the well-known British naval critic, Hector C. Bywater (for many years a resident of Berlin) who quotes Count Reventlow as follows: "What do we Germans understand by the 'freedom of the seas?' Of course, we do not mean by it that free use of the sea which is the common privilege of all nations in times of peace, the right to the open highways of international trade. That sort of freedom of the sea we had before the war. What we understand to-day by this doctrine is, that Germany should possess such maritime territories and such naval bases, that at the outbreak of a war we should be able, with our navy ready, reasonably to guarantee ourselves the command of the sea. *We want such a jumping-off place for our navy as would give us a fair chance of dominating the seas and of being free of the seas during a war.* The inalienable possession of the Belgian seaboard is therefore a matter of life and death to us. Our aim must be, not only to keep what

our arms have already won on this coast, but sooner or later to extend our seaboard to the south of the Straits of Calais."

So here, at last, the truth is out. The freedom of the seas is to mean freedom for the shipping of all the world until such time as Germany may see fit to declare war, when freedom of the seas is to become a German monopoly. Now, in view of the fact that this question of the seas is to figure so prominently in the terms of peace, whenever these shall come to be discussed, Count Reventlow has certainly done the world good service by thus so unreservedly letting the cat out of the bag.

"It is not the freedom," says Bywater, "but the absolute mastery of the seas that Germany covets, and scarcely a day passes without bringing new proof of this ambition." Thus in a recent issue of the *Deutsche Tageszeitung*, Count Reventlow made a vigorous demand for the full exploitation of the military successes in Italy. Austria-Hungary, he declared, absolutely needed the freedom of the Adriatic for her future development. "We confine ourselves to-day," he wrote, "to a general statement of our aims—that for the future an active Adriatic policy on the part of Italy shall be made completely impossible, and this, not by paper guarantees, but by real guarantees—that is to say, by appropriate territorial changes on the coast of the Adriatic." Evidently, the Teutonic alliance, if successful, intends to annex all the important strategic points on the Italian side of the Adriatic, and form a chain of bases that would enable its naval forces completely to dominate the Mediterranean. But Count Reventlow would not stop there. He would secure "two central points of power,"—the Adriatic and Constantinople with the Dardanelles. Such political, maritime and economic position would stand in the closest combination with the position of the German Empire in the Baltic and on the coast of Flanders. Says Bywater: "Here we have the same cynical avowal of the real aim that is disguised in the 'freedom of the seas' catch-word." With the Baltic a German lake, all the northern waters would be ruled by Germany; with the Flanders coast and the Pas-de-Calais fortified and honeycombed with naval bases, she would sit astride of every trade route converging on England; while from the strongholds of the Adriatic her raiders could issue forth to close the Mediterranean.

It is the command of the seas by the Allies that has saved the world from subjugation by the Teutonic alliance, and when the military and naval power of Germany has been completely disrupted, and the various plenipotentiaries assemble for the peace conference, this question of the "freedom of the seas" must be placed on such a sure basis and secured with such rigid guarantees, that this dream of Reventlow and the Kaiser for whom he speaks, shall be placed beyond any possibility, not merely of attainment but even of attempt.—*Scientific American.*

EXPERT CONTROL IN CONDUCT OF WAR.—Mr. Spenser Wilkinson, professor of military history at Oxford, and author of the article on "The Dardanelles" reprinted in the February PROCEEDINGS, has an interesting essay in the January *Nineteenth Century and After* entitled, "The British Constitution and the Conduct of War." His general thesis is that the governmental machinery established by the British constitution, while admirable in time of peace, has this weakness in war, that it fails to provide expert leadership and control of war departments and operations. In support, he quotes the Marquis of Salisbury, speaking in the House of Lords at the time of the South African War:

"If you will look back over the present century [he said—the nineteenth century] you will see there have been four occasions on which the British Government has engaged in war. On each occasion the opening of these wars was not prosperous. These were the Walcheren Expedition, the Peninsular War, the Crimean Expedition, and now the South African War. In all these cases at first—in the case of Walcheren not only at first—there were lamentable losses. . . . . We cannot have been so unlucky

as to have fought four times and to have lighted upon the most incompetent and worthless ministers that the world has ever produced. It is evident that there is something in your machinery that is wrong."

Mr. Wilkinson points out that the executive branch of all governments, whether monarchical or democratic, consists of a set of ministers and a chairman, the chief difference being that in monarchies the king either holds the position of chairman himself or selects his leader, whereas in democratic systems the leader is selected by popular vote, either directly or indirectly through a legislative chamber.

Speaking in general, the most important member of this committee or cabinet in time of war is, in Mr. Wilkinson's judgment, "the designer of victory, the exponent of the general's art, of which success in war is the object. In many governments no such office is found among the ministers because the task is reserved for himself by the head of the government, the King or Emperor. Of some governments a commander-in-chief is a member, and in the United States the command of the forces is by the constitution vested in the President.

"Some representative of the art of war is always necessary, for every question of policy is in the last resort one of force, and the key, both to the avoidance of war and to success in it when it becomes inevitable, lies in the due co-ordination of policy and strategy. The mode in which that co-ordination must be sought is a conference between the chairman of the committee, the minister of foreign affairs and the strategist, on each occasion when any new departure is taken in external policy. At such a conference the foreign minister would explain the course he had to propose, the strategist would then say what it might involve in case of conflict.

"Throughout the course of a war the strategist is required by the government; for once the appeal has been made to force, by force the issue is decided. Yet nothing is so common in war as for persons of great influence to urge a government to scatter its forces for purposes not directly conducive to victory though thought in themselves desirable. Especially is this the case when the possession of particular places seems advantageous or likely to influence opinion at home or abroad. Few but trained strategists understand that in war everything can be had by victory but nothing without it; and that victory requires the concentration of all possible forces to strike a blow at some one point in order to destroy the enemy's fleet or his army. There seems to be no limit to the errors in the direction of fleets and armies that can be committed by governments in the deliberations of which the voice of strategy is silent, divided or overruled.

"The strategist is even more essential to a government than the minister who maintains the naval or military forces, for that minister must base his arrangements on the requirements of the fighting, of which the strategist alone can judge. The minister's presence in the governing committee is needed mainly in order that his financial proposals may be presented to the representative chamber with all the authority of government.

"In the case of a maritime state and especially of an insular power there must of course be two strategists: one for the navy and one for the army, for the mastery of both sea and land warfare is rarely combined by one man."

After a historical review of control of the Army and War Department in England in time of war, Mr. Wilkinson turns to the navy:

"In the epoch of Nelson and Napoleon, the action of the navy was directed by a board which represented the Lord High Admiral in Commission. Another board was entrusted with the duty of supplying the ships and stores which formed the material portion of the fleet. But before the beginning of the reign of Queen Victoria, these two bodies were amalgamated into one, which combined the functions of command and supply. The chairman of this Board of Admiralty was the First Lord, the Cabinet Minister, a political personage unacquainted with war. Its

other members were four Sea Lords, one or more Civil Lords and a secretary. The political chief, the First Lord, had power, with the concurrence of one other member of the board, to act in the name of the whole committee. In 1895 I ventured to criticise this arrangement by pointing out that it failed to provide the navy with a commander-in-chief for war, and suggested that the First Sea Lord should be made commander-in-chief and be given authority in peace and war to issue all orders for the distribution and movement of ships and fleets; that his should be the office in which should be prepared all orders to the admirals commanding squadrons or fleets, and that he should be selected on the sole ground of his strategical and tactical qualifications for this duty. These criticisms and this proposal were supported, for a few weeks only, by the Navy League, with the net result that the First Sea Lord was formally recognized by the government as its naval strategical adviser. But there was no consistent attempt to select a First Sea Lord on the ground of mastery of naval operations, and no attempt whatever to relieve him of the many administrative duties to which it was impossible he could properly attend if he really devoted himself to strategical problems and to the study of the operations of a future naval war. Mr. Churchill, indeed, on becoming First Lord of the Admiralty in 1911, created at the Admiralty an office akin to that of the chief of a General Staff of an army, but the head of this office was not made a member of the Admiralty Board, and occupied a comparatively subordinate position.

"During the course of the war there has been some slight development. The Chief of the Admiralty Staff has been brought into closer relation with the First Sea Lord, whose function as strategical director of the navy has been emphasized, though he still seems to be more deeply immersed in general administrative business than is consistent with complete concentration on the business of a strategical direction, which ought always, in my judgment, to be inseparable from his position. Authority without strategical insight must be expected to fail in war; for without the judgment produced by a life's study of the operations of war, no man can hope to solve happily the problems which war presents. But no insight will avail unless it is coupled with authority. A strategist who has not the power to have his solution carried out and put into execution is not a commander.

"The government has lately appointed a most distinguished administrator to be First Lord of the Admiralty. It is beyond doubt a wise move to appoint an administrator to be the head of the administrative business of the navy. And this, according to my reading of the lessons of history, would be best accomplished by reviving the distinction between supply and command. Command should be the function of the First Sea Lord; his should be the voice to explain in the cabinet his design for the conduct of the naval war; his the voice communicating that design to the naval officers afloat. If the administrator must also be a First Lord, it might conduce to a better understanding of his functions if he were to be called the 'First Shore Lord.'

"There are two delicate points which I have hitherto passed over. The first is, the place, in a geographical sense, of the commander-in-chief of either service. Should he be at the headquarters of the principal army or of the main fleet, or should he remain at the seat of government? I suggest that this should be left entirely to him. The modern facilities for movement from place to place and for the transmission of documents—even of considerable length—make it easy for a commander to communicate his views from one place to another.

"The great difficulty consists in the selection of men qualified for supreme command. To produce leaders is the chief function of national education; to discover them and to put power into their hands is perhaps the highest and the hardest function of the statesman. For there is no selection without rejection. The task is, however, less difficult in war than in peace because in war everyone understands the application of the precept 'by their fruits ye shall know them.'

"The general answer to the question raised by the title I have chosen is that the cabinet system is a machine suitable for the conduct of war, provided the cabinet is a council of heads of the great departments—under the presidency of the Prime Minister—and provided also that each minister is a master of the subject with which his department is concerned. Its efficiency is diminished in proportion as the members lack the necessary command of their subjects, and by the presence of members having no departments to supervise. Only the head of a department can be fully in touch with the problems that arise in it; and the opinion of a person deprived of that touch is apt to be in the nature of advice in the air.

"The story which I have told of the attempts of governments carried on during a quarter of a century to set in order the machinery for the direction of the army and the navy, illustrates what I believe to be the chief weakness of our national life—the want of faith in knowledge.

"The members of a government require more than ability; each of them requires a mastery of a subject, of the art or science upon which are based the activities of the office which he aspires to direct, and of its application. This mastery is to be had only through a long apprenticeship—the devotion of the best years of a man's life to the profession to which he is called. There are only two methods of forming a committee for governing a nation—for directing the nation's work. One is that hitherto practiced, by which a personage distinguished by party services, or by anything except mastery of the business which he is to superintend, is placed as Cabinet Minister at the head of a department, while its permanent chief, presumably the competent man, is made his subordinate, his adviser whose advice he may reject. This is government by incompetence. It has been accompanied by inefficiency and confusion and can lead only to defeat. The other method is to appoint as Cabinet Minister at the head of each department the most competent master of the work which that department has to do. The old wrong method was due to conditions which made the consideration of party all-important. It may be doubted whether, worked on that method, the constitution is as satisfactory as the late Lord Salisbury thought it for the production of happiness; assuredly it will never produce victory. But in war the mere thought of party is treason.

"Unless the spirit in which the constitution has been worked for the last 50 years is changed within the next six months, the constitution and those who have worked it will disappear in defeat and revolution. To-day the submarine and the aeroplane are telling all men that the alternative is between defeat and victory. Victory cannot be won by a government of amateurs. A government that seeks victory must begin by entrusting the conduct of the war to men who understand war."

DAZZLE SHIPS.—The following statement has been issued through the British Press Bureau:

"It has been stated at various times in the press that the Admiralty have not realized the value of camouflage as a means of assisting to defeat the attacks of enemy submarines on mercantile shipping, and that such camouflage as has been tried is not of British origin.

"It can be stated that the Admiralty are fully alive to its value, and several months ago a system of camouflage was originated. The principles governing it cannot be divulged at present, but it may be said that it has not invisibility for its basis.

"The theory of rendering ships invisible at sea by painting them various colors is no longer tenable; endless endeavors have been made in this direction, and numerous schemes given fair trial by the Admiralty under actual conditions at sea.

"The results of these trials have invariably been disappointing, and it has been finally established that, unless a vessel and her smoke can be rendered absolutely invisible, no useful purpose is served.

"The application of Thayers law is most commonly put forward as a means of obtaining invisibility. This, broadly speaking, is an adaptation of nature's means for eliminating shadows, and so reducing the visibility of birds and animals at close quarters, either for purposes of attack or defence, and it is stated that this can be applied to ships by painting the ceilings of promenade decks or other projecting structures white, in order to eliminate all shadows.

"Actual experiences at sea have proved that this is a fallacy, and that the paint itself being dependent on the light of the sky will not overcome shadows.

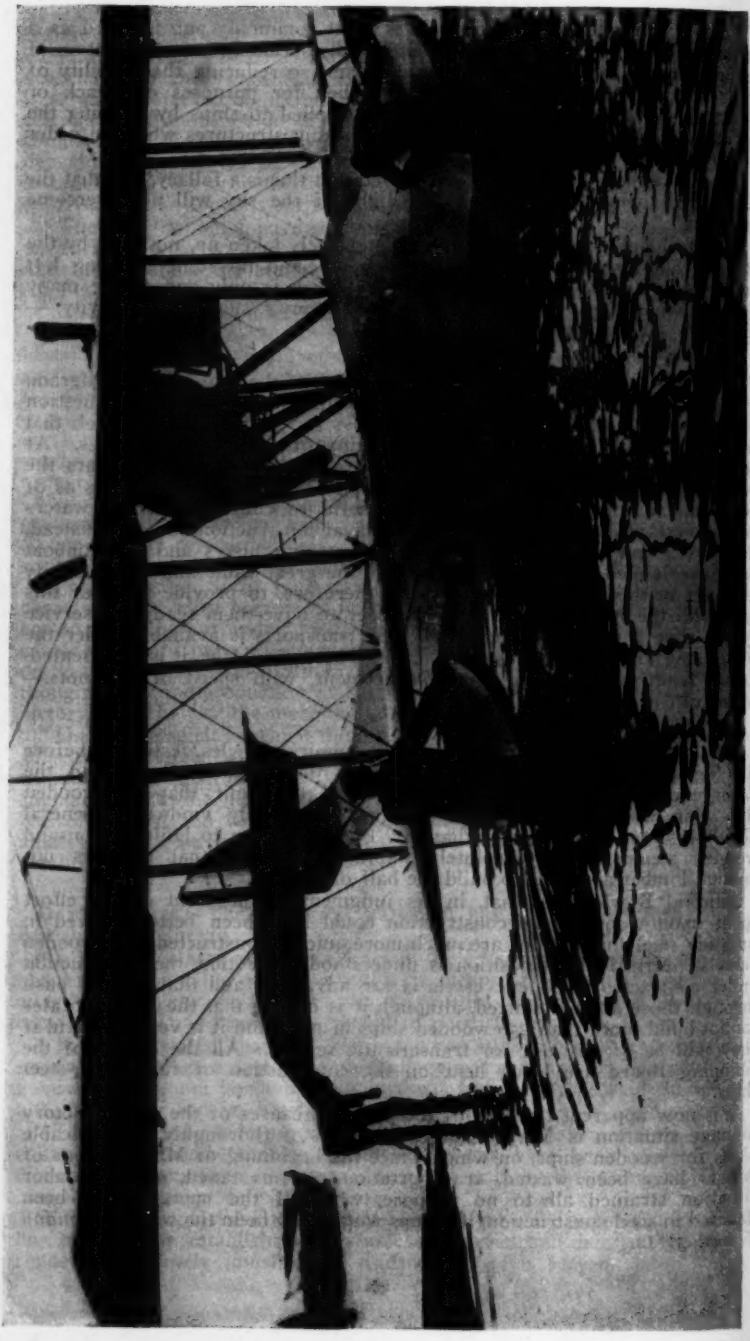
"The scheme now in use has been extensively taken up, not only by the British, but also by the allied governments, and no stone is being left unturned to utilize this important asset, which is only one of the many devices which are used to combat the enemy's submarine activity."—*Nautical Gazette*, 31/1.

THE NEED OF CONVOYS.—With the expansion of the shipbuilding program, it has become necessary for the naval authorities to take up the question of furnishing a sufficient number of convoys for the increase in vessels that will be available for oceanic transportation of troops and supplies. At present there is a deficiency in this type of vessel. For many years the Navy Department regarded vessels now suitable for use as convoys as of no special military value. They were useful, of course, in certain waters and on certain duties, but the policy of naval construction favored, instead, destroyers and capital ships so that the small cruisers and the gunboat were overlooked without anticipation of the great value and serviceability they are in this war. It is necessary, therefore, to provide ships of this type with the least possible delay in order to have them ready for service by the time a corresponding number of transports is available under the completing plans of the shipping board. These should be, it is represented, as of from 1500 to 1800 tons displacement, with speed of 16 knots.—*Nautical Gazette*, 31/1.

FAILURE OF THE WOODEN SHIP.—Rear Admiral Bowles, testifying before the Senate investigation of the affairs of the Shipping Board and the Emergency Fleet Corporation, was forced to admit that the wooden ship plan was a failure. His evidence completely vindicates General Goethals's stand, and proves that Mr. Denman's plan to build a thousand wooden steamships is absolutely impracticable, and that there is not enough lumber available to build the half of them.

Admiral Bowles said that, in his judgment, 90 per cent of the effort spent upon wooden ship construction could have been better utilized in building steel ships, which are much more quickly constructed than wooden vessels. Mr. Hurley's position is understood to be that the construction under contract of wooden vessels is far advanced, and that he will push through those already started, although it is certain that the United States cannot build more than 250 wooden ships in 1918, and it is very doubtful if they will be of any use for transatlantic service. All the efforts of the Shipping Board are being bent on the construction of fabricated steel ships.

It is now apparent that one of the principal causes of the unsatisfactory tonnage situation is Mr. Denman's adoption of thoroughly impracticable plans for wooden ships, on which, since the beginning of May, millions of dollars have been wasted, transportation systems taxed, and the labor situation strained all to no purpose, when, if the energies had been devoted to steel construction, the ships would now be in the water.—*London Times*, 31/12.



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FRENCH PLANES GUARD AMERICAN NAVAL BASE IN FRANCE.

ATLANTIC

SIX U. S. SEAMEN KILLED BY FALLING FOREMAST ON THE U. S. S. "MICHIGAN."—Secretary Daniels gave out the following statement this morning:

In a heavy gale at sea on January 15 six men were killed and three injured on the U. S. S. *Michigan* by the falling of the foremast.—*Official Bulletin*, 17/1.

PATROL BOAT ON ROCKS.—An American patrol boat was to-day reported to the Navy Department ashore on a rock in European waters.

The vessel went ashore during a fog on January 25. There was no loss of life or injury to the crew. The vessel will probably have to be abandoned.—*Baltimore American*, 29/1.

LOSS OF THE ARMY TRANSPORT.—The first loss of an army transport has been mercifully lacking in a formidable casualty list. The place of the occurrence of the sinking of the *Tuscania*, while evidently a surprise, was accountable for the rescue of so many of those on board. The accident has failed to produce the sensation, while it has not failed to arouse public sympathy, expected of the loss of the first army transport en route to Europe. It has been felt that a dire disaster was needed to stir the people of this country to a realization that we were actually at war. It was appreciated that this would be an exceedingly heavy price to pay for securing the necessary national ardor and resentment against an enemy necessary to give support to the war. The successful attack by the German submarine in this case is probably only the beginning of like disasters, of which the public has been repeatedly warned. It has the immediate effect of effectually dispelling the complacent impression that our adversary did not seriously intend to attack our troop ships for some occult reason that would have been characteristic enough in some particulars, but hardly supposable of pitiless, determined German warfare in the presence of an opportunity. The disaster invoked the following statement from the Secretary of War:

The sinking of the *Tuscania* brings us face to face with the losses of war in its most relentless form. It is a fresh challenge to the civilized world by an adversary who has refined, but made more deadly, the stealth of the savage in warfare. We must win this war, and we will win this war. Losses like this unite the country in sympathy with the families of those who have suffered loss; they also unite us to make more determined our purpose to press on. As rapidly as details come in they will be given to the public in order to relieve anxiety where possible, and notice will be sent as promptly as possible to those whose sons and brothers have been added to the nation's heroic dead.—*Army and Navy Register*, 9/2.

This was not in the zone patrolled by the U. S. destroyers.—*N. Y. Times*.

OUR HARDY DESTROYERS.—*One in European Service Steamed 25,000 Miles Without Docking.*—American destroyers are standing the strain of war service in foreign waters better than the most sanguine official here expected. Recent reports from the destroyer force show that few vessels have been out of commission for any length of time for repairs, despite the arduous character of their work. The seamanship of the men aboard the fighting craft and the skill of the picked forces on the repair ships are held responsible for the result, although substantial construction, selected material and good designing play their part.

The most striking instance of the seaworthiness of these light craft is that of a destroyer which went into drydock only after having steamed more than 25,000 miles. Examination showed the boat needed only scraping and painting. Her engines and machinery equipment generally had been kept in perfect order by her own men and the repair ship crews while she was afloat.

FRENCH PLANES GUARD AMERICAN NAVAL BASE IN FRANCE.

Photo from Underwood & Underwood, N. Y.

The durability of the boats is especially striking in view of the fact that their plating is only a little more than a quarter of an inch in thickness. They were not built for high speed in rough water, yet the call of a merchantman, beset by a submarine, sends them plunging through gigantic seas at a racing gait. There have been cases where the impact of the water twisted the bows somewhat, but these are few, and the damage was easily repaired. Steering engines have worn out, and boilers have been replaced or retubed, in most instances by the repair ships. British officials have expressed high admiration for the handling of the flotilla in this regard.

A complete supply of spare parts for the boats has been assembled at the base, and the officers in charge of the engineering problems are picked men.

As the destroyer construction program moves forward at home, the strain on the boats abroad will lessen. Congress has been warned, however, that the strenuous character of the work in chasing submarines is certain to wear out some of the older boats.—*N. Y. Times*, 21/1.

U. S. FLEET ON GUARD WITH BRITISH.—We are apt to forget that over on the other side the control of the surface of the ocean has been absolutely maintained by the existence of the British battleship fleet. There have been a few raids on the coast of England, and a few engagements in the North Sea, but to-day the relative strength of the British Navy is at least as great against the German Navy as at the outbreak of the war. Furthermore, they have the active cooperation of the French and American surface ships of heavy tonnage. We have, of course, many battleships on this coast that little is heard about. We have had to use the oldest ones largely as training schools, especially for the training of the gun crews of the merchant ships. (From speech of Assistant Secretary of the Navy.)—*N. Y. Times*, 17/2.

The work of the United States is not now confined to destroyers. The Secretary of the Navy, Mr. Daniels, has announced that naval vessels of every type are now doing service abroad.

The most definite information on this subject, however, is given by Representative Miller, of Minnesota, who recently returned to the United States after interviewing many British and French naval commanders.

The American battleship fleet is no longer "bottled up" in sheltered waters in fear of submarine attack. Several of the first-class ships have been sent abroad. These are coal burners, which for a time, at least, will relieve the British battleships of the oil burning type.

What portion of the fleet is now working with the British Navy is, of course, kept a military secret, but the American people at least have the assurance that the United States Navy is doing its full duty in maintaining the allied guardianship of the seas.

The facts about the American fleet are woven into a speech made in the House by Representative Miller in the course of a presentation of war conditions as he observed them while abroad. His statements, made partly because he told of things he saw and partly from things he was told by British and American naval commanders, shed a light upon the whereabouts of the American fleet and its operations that hitherto has been locked in the secret archives of the Navy Department.

Mr. Miller frankly told the House that when he was there Vice-Admiral Sims had 36 destroyers—not the number now—with which to patrol waters assigned to him. These waters extended west of the coast of Ireland, down across the western entrance of the English Channel, clear across the western coast of France and Ireland, the coast of Spain, down to the Azores Islands.

"This number was grossly insufficient," Mr. Miller said, "but the navy has started on a program that will produce any needed destroyers. Some of these destroyers are being delivered."

Before the sinking of the *Tuscania*, which occurred in waters outside the zone being protected by American craft, Mr. Miller said that disaster had been narrowly averted more than once, and that the navy's first duty was to protect the line of communication between France and America.

The speaker said he was in Europe when the request was made for American battleships, and he said that request had been granted.

"They have been sent," he said, "and no better battleships ever floated on a sea. I was afraid our navy would not send them, but I made particular inquiry and followed it up and found they have been sent."

That the American war craft are in the thickest of the submarine danger zone is shown by what was said of the area covered by the German submarines. Much of this area is said also to be covered by American craft.

"The main submarine base," Mr. Miller said, "is at Zeebrugge, on the North Sea. The main area of operation is across the northern part of Scotland and the upper part of Ireland, and then the English Channel. Continuing, their field is the Bay of Biscay, then along the coasts of Spain and Portugal, and then out to the Azores."

"Moments of grave danger are just about sunrise in the morning and sunset at night, especially if the sea is calm. Because during that twilight period there is that uncertainty of light which makes it difficult to discover the periscope of a submarine, but easy for the submarine to see the hulk of the ship in bold relief," said Mr. Miller.

In showing the valuable contribution made to naval strategy by Vice-Admiral Sims, Mr. Miller said his suggestion was this:

"What is the use of sending destroyers and ships of your navy scouring the seas, hunting for submarines? The seas are vast and the submarine is small. They may seek for days and weeks and not find their quarry, but you group your ships together and put your destroyers about your ships and you are bound to have your destroyers meet the submarine. The submarine must find the ships and in finding the ships he meets his deadly enemy."

This suggestion of Vice-Admiral Sims was finally accepted by the British Admiralty.

Mr. Miller declared Congress and the Navy Department should give Admiral Sims absolute carte blanche and carry out whatever he recommended.

Mr. Miller related this incident to emphasize his belief that there should be better co-ordination in the handling of both merchant ships and the protecting war craft.

"Two ships had left a port in France and were some fifty miles up the coast when instructed by wireless to wait for some other boats. They were to leeward of an island, with all communication between them and the shore cut off.

"After they had waited five days the destroyers to escort them through the submarine zone appeared. For some unaccountable reason the ships did not sail even then. The destroyers fooled around, going back and forth for further orders. On the eighth day, under most unfavorable conditions, this group set forth. Why, submarines had been for a week spotting exactly where they were. Is it any wonder they were attacked twice before they got through the zone?"—*N. Y. Herald*, 15/2.

GERMANY EXTENDS SUBMARINE BLOCKADE ZONE; U. S. IS NOTIFIED THROUGH THE SWISS LEGATION.—The Swiss Legation in Washington has transmitted to the Department of State the following communication from the German Government:

"Supplement to the German declaration of January 31, 1917, concerning the blockaded zone.

"On and after January 11, 1918, a new zone of sea is declared blockaded around the enemy point of support in Cape Verde Islands and Dakar and the adjoining coasts. That zone is bounded as follows:

"From the Cape Palmas lighthouse toward the point 10° 0′ N., 29° 30′ W., to the point 17° 0′ N., 29° 30′ W., to the point 20° 30′ N., to the point 25° 30′ W.; there the line follows the parallel 20° 30′ latitude northeastwardly as far as the point where that parallel strikes the western coast of Africa.

"On the same date the zone blockaded around the Azores will be extended eastward as far as Madere Island, which is used by our enemies as a point of support, so that the zone will be bounded as follows: From point 44° 0′ N., 34° 0′ W., to point 42° 30′ N., 37° 0′ W., to the point 37° 0′ N., 37° 0′ W., to point 30° 0′ N., 27° 0′ W., to the point 30° 0′ N., 17° 0′ W., to the point 34° 0′ N., 12° 0′ W., to the point 36° 45′ N., 12° 0′ W., and back to the starting point.

"Neutral vessels which at the time of publication of this declaration happen to be in ports within the new blockade zone may yet leave those ports without coming under the military measures ordered for that zone if they can leave before or on January 18, 1918, and take the shortest route to the free regions. Sufficient time has been allowed so that neutral vessels that may enter the new blockaded zone without having a knowledge of the present declaration or unable to gain such knowledge be spared.

"It is earnestly recommended that neutral shipping be cautioned and warned off the blockade zone."

Berlin, January 5, 1918.—*Official Bulletin*, 31/1.

HUNTING U-BOATS 300 MILES AT SEA.—*Commander Taussig, Who Took Over First Squadron of Our Destroyers, Tells of Hazardous Work.—A Hard Bird to Catch.—Advantage Over Surface Craft is Difficult to Overcome, but Destroyers are the Best Weapon.*—More destroyers as the surest defence against the submarine are recommended by Commander J. K. Taussig, U. S. N., who commanded the first squadron of American destroyers that joined the British patrol vessels in Irish waters after the United States entered the war. Commander Taussig made this statement in an address delivered at the recent war thrift meeting in Carnegie Hall, and gave a picture of the routine of patrol work and the difficulty of actually getting at particular submarines.

That actual destruction of enemy submersibles, a comparatively infrequent feat, is only a part of the work of protecting the merchant marine was evident from Commander Taussig's statements. In seven months, he said, his own destroyer got a chance to fire at a submarine only once. With depth bombs, he said, he thought he had damaged one or two, but could not be sure he had sunk any. And yet in convoy and patrol work his vessel, and those associated with it, did extremely valuable work in the protection of the lanes of traffic.

"When the United States became a belligerent last April," he said, "one of the first requests the Allies made was that we send as many destroyers and other patrol boats as we could possibly muster over to the other side to assist them in combating the submarines. At 9.30 one April night I received orders to proceed at daylight to my home navy yard to fit out for distant service. What was before us I did not know. There were five other commanding officers of destroyers who received the same orders, and at 5 o'clock the following morning we left Chesapeake Bay and were on our way to New York and Boston at a high speed, in order that we might get ready as soon as possible for whatever it was to be.

"So anxious was the Navy Department that the outside world in general know nothing of the movement of these ships that not even I, who was in command of the expedition, was informed of our destination. We went to the navy yards, the ships went in dock, had their bottoms cleaned, painted; we took on stores and provisions to last three months, and in a few days sailed from Boston. My orders were to proceed to a point 50 miles east of Cap Cod, and then open my sealed instructions. Until I got to that point, at midnight of the first night out, I did not know that our first port of call was to be Queenstown, Ireland.

"It is quite natural that the few in authority who knew of our movements watched with anxiety for news of our crossing. It was the first time that vessels of this type had ever made so long a continuous passage without refueling or without the company of larger vessels. We were 10 days in making the trip, due mostly to a southeast gale, which accompanied us for 7 of the 10 days. So rough was the sea during this time that for 7 of the 10 days we did not set our mess tables; we ate off our laps. On the ninth day we were pleased to be met by a little British destroyer named the *Mary Rose*. She picked us up early one morning and came along flying the international signal, 'Welcome to the American Colors.'

"To this I replied, 'Thank you, we are glad of your company.' The little *Mary Rose* then accompanied us to Queenstown. I am sorry to say that three months later the *Mary Rose* was sunk with all hands by a German raider in the North Sea. We received a very hearty welcome at Queenstown by the British Admiral, Sir Lewis Bailey, and by the others in authority there. They were very glad to see us.

"Things were looking black. In the three previous weeks the submarines had sunk 152 British merchant ships. It was manifest that this thing could not go on if the Allies were to win the war. The British admiral gave us some wholesome advice in regard how best to fight the submarines. We immediately prepared for this service by having what are known as depth charges or depth bombs installed. We put ashore all of our surplus stores and provisions in order to lighten our draft, as it was possible that a few inches might save us from striking a mine.

"The seriousness of the work before us was made very evident, not only by the large vessels that were being sunk, but by the fact that the night before we entered the harbor a German submarine had planted 12 mines right in the channel. Fortunately for us, they were swept up by the ever-vigilant British mine sweepers before we arrived. The day following our arrival one of the British gunboats from our station was torpedoed and her captain and 40 of her crew were lost.

"Patrol vessels were continually bringing in the survivors from the various ships as they were sunk. The British admiral told us that we would go on patrol duty for six days at a time. and then come in for two or three days' rest. In this patrol duty we were assigned to certain areas, as far as 300 miles off shore, as the submarines were then operating that far out. Our orders were first to destroy submarines, second to escort our convoy valuable merchant ships; third, to save lives if we could. We did escort many ships, and we did save many lives.

"I cannot say that we sank many submarines. The submarine, I found, was a very difficult bird to catch. He has tremendous advantage over the surface craft. In the first place, he always sees you first. First, because when on the surface he is very low, and when submerged he has only his periscope out, or perhaps nothing at all. As he was not after destroyers, he avoided us whenever he could. That is, if he saw the destroyer on the horizon, the submarine immediately went the other way.

"When we saw a submarine, which sometimes happened frequently, and at other times several weeks might pass without seeing one, we would immediately go after him full speed, and open fire with our guns in the hopes of getting in a shot before he submerged, but he always submerged very quickly. Only once did my vessel in seven months succeed in actually firing at a submarine. He then went down after the fifth shot was fired. At that time he was 5 miles away. But what they are afraid of are the depth charges or depth bombs.

"I will tell you how they operate. A depth charge is about two or three hundred pounds of a high explosive. It is fitted so as to explode automatically at any depth we may desire. The destroyers and patrol vessels carry them on deck at the stern. When we see a submarine submerge we try to find his wake, and if we can see the wake of a submerged vessel we run over it, drop the depth charge by simply pulling a lever, and in a few seconds there is a terrific explosion.

"This explosion is so great that on one or two occasions, when I happened to be in the chart house when they let go, I thought my own ship was torpedoed. They can be felt under water for a distance of several miles, but of course they must be dropped very close to the submarine in order to destroy him. If we get it say within 90 feet of the hull, it may damage it enough to cause him to sink, otherwise only superficial damage may result.

"I cannot say positively that I sank any submarines. I saw results on several occasions which led me to believe that I had at least damaged one or two.

"The patrol duty was very trying, as the ocean was strewn with wreckage for a distance of 300 miles off shore. It was hard to tell a periscope when we saw one. Fish, floating spars, and many other objects were taken for periscopes and fired at; we could not afford to take a chance, as our whole safety depended on our being vigilant.

"The submarines became less active—I won't say they became less active, but they did less damage as the summer wore on, due, undoubtedly, to having more patrol vessels.

"Then the scheme was taken up of having convoys. The advantage of a convoy is that 6 or 10 destroyers can protect from 20 to 30 merchant ships, while in the patrol system only one destroyer could be with one merchant ship at a time. The convoy system has now developed so that practically all vessels passing through the danger zone are in large convoys of from 10 to 30, with an escort of from 6 to 10 destroyers.

"These convoy trips would take us out of port from six to eight days. They were very trying days, especially during the latter part of the fall, when the weather got bad. When we are at sea in this way we do not take off our clothes, neither officer nor man. We must be ready at all times. We do not even have the pleasure of taking a bath, as something might happen and you would not be ready for it. As one young officer expressed it, we had to come down to the Saturday night bath habit, and if we happened to be at sea Saturday night we might be out of luck.

"The night work was very difficult, as the danger of collision was great, with so many ships without lights operating in close proximity. There are frequent collisions, and we must use our judgment as to whether we should turn on our lights and avoid the danger of collisions, and take the risk of a submarine seeing us, or keeping our lights out and taking our chances. We have this to remember, that if a submarine sinks us, she only sinks one ship, but a serious collision may result in the sinking of two ships, so it is a matter of judgment.

"The question is, can we beat the submarine? I am sure we can if the people will do their part. We now have enough destroyers, or almost enough, to make the convoy system successful. We want more destroyers in order that we can have a patrol in addition to the convoy. When we convoy we are on the defensive, we do not see the submarine unless it comes to us, but when we are on the patrol we are on the offensive, we go out and look for them, and we hound them until we destroy them or drive them out of the area. So we must have enough for both."—*N. Y. Times*, 3/2.

NORTH SEA AND CHANNEL

COLLISION SINKS GUNBOAT IN CHANNEL.—The British torpedo gunboat *Hazard* was sunk in the English Channel on January 28 as the result of a collision, the Admiralty announced. Three men were lost.

[The torpedo gunboat *Hazard* was built in 1894 and measured 1079 tons. She was 250 feet long and her normal complement was 115 men.]—*N. Y. Herald*, 31/1

BERLIN REPORTS NAVAL ATTACKS ON OSTEND.—Ostend, on the Belgian coast, has been bombarded by naval forces, it is announced in army headquarters' report.—*Evening Star*, 21/1.

GERMAN MINES SINK OWN DESTROYERS.—The mine field responsible for the sinking of the German destroyers *A-73* and *A-79* was of German origin. the 17 men from the crew of the *A-79*, the only survivors from the two vessels, suffered greatly four days in the open sea. It was from these survivors it was learned the mine field was German.—*N. Y. Herald*, 26/1.

WIDEN PROHIBITED ZONE IN NORTH SEA.—Notice of the alteration of the probibited zone in the Irish and North Sea channels issued by the British Admiralty was transmitted to the State Department by the American Consul General in London. Navigation is now forbidden to all vessels in the area bounded on the northwest by a line joining latitude 56 degrees, 22½ minutes north, longitude 6 degrees, 17 minutes west, and latitude 55 degrees, 31 minutes north, longitude 6 degrees, 2 minutes west, bounded on the southeast by a line joining latitude 55 degrees, 13½ minutes north, longitude 5 degrees, 30 minutes west, and latitude 55 degrees, 2 minutes north, longitude 5 degrees, 40½ minutes west, bounded on the southwest by a line joining first and fourth points, bounded on the northeast by a line joining second and third points.—*N. Y. Herald*, 5/2.

FIGHTING U-BOATS FROM TOWED KITE BALLOONS.—Among other agencies brought to bear on the German submarines is the kite balloon of the type so extensively employed on the fighting fronts. The French Navy, in particular, is employing a number of kite balloons with tenders for the purpose of spotting U-boats lurking near the coast and at the entrances to important harbors. The life of the kite observer at sea is full of thrills, especially during those times when he climbs up to the balloon swinging above the trawler and when he slides down the ropes to the deck of the trawler. It is said of these kite observers that some of their feats in this connection would compare most favorably with those of a trained tight-rope walker. But once in the basket of the balloon, the work is devoid of that excitement which is part and parcel of the work of the land observer. The U-boat can be readily spotted from a height of a few hundred feet, even when they are below the surface of the water, provided the sea is not too choppy and the light conditions are favorable.—*Scientific American.*

SEA YIELDS UP GERMAN DEAD.—Belief that a naval engagement has occurred is expressed in a dispatch received in Stockholm from Gothenburg and forwarded by the correspondent of the *Morning Post*. The dispatch reports the recovery of a large number of bodies of German sailors, who apparently belonged to a warship.

Gothenburg is on the western coast of Sweden, and is near the Skagerrak, one of the bodies of water connecting the North and the Baltic seas and the one nearest the North Sea. The North Sea in the vicinity of the Skagerrak has been the scene of previous naval engagements, the great battle of Jutland having been fought there.—*Washington Post*, 17/2.

THE THIRD ATTACK ON YARMOUTH.—Yarmouth, January 15.—Yarmouth, which was bombarded in November, 1914, and again at Easter, 1916, was made the target of enemy guns for the third time last night. It is not known whether a destroyer or a submarine made this last attack, which opened at 11 o'clock when a star shell lit up the town. A fusillade of shells followed, and swept the town for about five minutes, after which the raider vanished. Many of the inhabitants were in bed, and others were at supper, while some were making their way home from picture theatres. People who were out state that they heard the whistle of the shells overhead, and saw glares in the sky as the explosions occurred.

Four deaths have been reported. One person was killed and another severely wounded in one house by a bursting shell. A man and his wife are two other victims, and a sailor was killed on board a steamer in the harbor. Other casualties occurred, some persons being severely, and others only slightly, injured.

One shell wrecked the frontages of several houses and shops. The roofs of some houses were carried away, and the fronts of other premises were destroyed. A doctor's house was badly knocked about, while concussion caused by the exploding shells caused other damage to property. On the whole the damage was not great. Houses were filled with brickwork, stoves were blown out, doors wrenched from their hinges, and much window glass was broken. Many persons had remarkable escapes. One room was wrecked, but the child sleeping in a cot escaped without a scratch. Everything happened so quickly that all the damage had been done before people realized what was happening.

The inquest will be held to-morrow.

THE ATTACK ON YARMOUTH.

The Raid: A Comparison.—The accounts of the British raid on Karlsruhe and the German raid on Yarmouth contain instructive points of contrast. The former was persumably in the nature of a reprisal, and it may be recalled that the bombardment of Whitehaven by a submarine in August, 1915, was said to be a reprisal for the shelling of a Turkish troop train by a British submarine in the sea of Marmora. But in every other sense, what a difference! The British airmen attacked in broad daylight, selecting as targets for their bombs railway junctions, munition works, and other establishments, all of military value. They also waited after the job was done in order to obtain photographic confirmation of the destruction wrought. The place they attacked was defended both by anti-aircraft armament and by aeroplanes.

Compare these details with those of the attack on Yarmouth. It occurred on one of the darkest nights of the winter, and the raider hurried off in haste after he had thrown a few shells into the town. No damage was, or could have been, done which is likely to have any influence on the progress of the war. This business was pure devilry. There is no real menace to the security of our shores from such attacks, which from a naval or military point of view are singularly futile. That the raider was a sub-

marine is most probable, for a formation of destroyers or a squadron of light cruisers would have carried out a heavier bombardment. There is, indeed, a close resemblance in this case to those of Seaham, Southwold, and Scarborough. The object of the enemy is to maintain the fiction that our control of the North Sea is in dispute, and to produce a pleasing spectacular effect for German eyes, which acts as a set-off to disasters elsewhere. Funchal, in Madeira, and Bayonne, in the Bay of Biscay, are other places which have been subjected to the same kind of wanton outrage.—*London Times*, 10/1.

MEDITERRANEAN

BRITISH CRAFT SUNK IN MEDITERRANEAN.—The transport and the fleet auxiliary which were sunk early this month in the Mediterranean, as announced in the House of Commons last week, were the *Aragon* and the *Osmanieh*.

The British steamship *Aragon*, 9588 tons gross and 513 feet long, was built in Belfast in 1905 and was operated by the Royal Mail Steam Packet Company of Belfast before being taken over by the British Admiralty. The British steamship *Osmanieh*, 4041 tons gross and 360 feet long, was built in 1906 and owned in London.—*N. Y. Herald*, 31/1.

SUNK A DUMMY CRUISER.—*U-Boat in the Mediterranean Neglected a Convoy to Attack it.*—Apropos of the story printed in the *New York Times*, of the exploits of the British dummy naval vessels, which has been republished here and read with much amusement and interest, Reuter's Agency is informed of one authenticated case of a valuable convoy proceeding to the Dardanelles, followed by a "cruiser."

A German submarine that was in the neighborhood allowed the convoy to pass and reserved its energies for the "cruiser." The Germans must have been greatly surprised when they saw the big guns from the supposed warship floating away from the wreck.—*London Times*.

BRITISH AND TURKISH SEA ACTIONS.—In an action between British and Turkish warships on the morning of January 20, at the entrance to the Dardanelles, the Turks lost one of their most effective warships, with the chances that the fine battle cruiser *Sultan Yawuz Selim*, formerly the *Goeben* of the German Navy, may also prove a total loss. The armored cruiser *Midilli*, formerly the *Breslau* of the German Navy, was the vessel lost. Both of the Turkish warships were manned by Germans, and they only had opposed to them two old monitors and two destroyers and some seaplanes. The British lost the monitor *Raglan* and the small monitor *M-28*, which, so far as vessels go, are minor losses. The *Sultan Yawuz Selim* was so badly damaged by a mine that she had to be run ashore at Nagara Point, in the narrows of the straits. She has been further bombed by British aircraft and may yet prove a total loss. The *Midilli* was sunk by striking a mine after being driven by British destroyers during the fight into a British mine field. Turkish destroyers attempting to go to her rescue were driven off by British destroyers, and the British rescued 172 Germans of the *Midilli*. Her complement was 373. Of the total men on the two British ships 132 were saved; 220 men perished. The *Sultan Selim* and the *Midilli*, the British Admiralty explains, had emerged from the Dardanelles to attack British naval forces north of the island of Imbros. After the *Raglan* and *M-28* were sunk the *Midilli* went to the bottom, and the *Sultan Selim* to escape then headed toward the Dardanelles at full speed and struck the mine. The British Admiralty reported on January 23 that the bombing attacks on the *Sultan Selim* were being continued, and that two hits with heavy bombs had been made.

The Turkish official report of the action says: "In a clever attack the cruisers *Sultan Selim* and *Midilli*, with some topedo-boats, issued from the Dardanelles January 20 in order to destroy enemy forces which had been located near the island of Imbros. Two enemy monitors, the *Raglan*, 4500 tons, with two 14-inch guns and the *M-28*, 500 tons, with one 9-inch gun,

and another smaller gun; a transport ship of 2000 tons, a signal station and numerous munition depots were destroyed. There was lively aerial activity on both sides. An enemy airplane was shot down in an aerial fight, and a second was seriously damaged. Our coast batteries successfully bombarded enemy torpedo-boats. On the return trip the *Midilli* was sunk by striking several mines."

The *Sultan Selim* was a sister ship to the *Moltke*, and was completed in 1912. She was a 28-knot ship, had a length of 610¼ feet and a displacement of 22,640 tons. She used both coal and oil in her furnaces. Her main battery was ten 11-inch guns and she was provided with two torpedo tubes. She had side armor of 11 inches and armored decks of 3 inches. Her complement was 1025 officers and men. She and the *Midilli* were nominally purchased from Germany in August, 1914, but the sale is held to have been entirely spurious. Both vessels successfully eluded the Allied warships on the watch for them in the Mediterranean and reached a Turkish port safely.

The *Midilli* was completed at Stettin in April, 1912, and her best speed on an hour's run was 27.55 knots. Her length over all was 446 feet and her normal displacement was 4550 tons. She had an armor belt amidships of3½ inches, an armored deck of 2 inches and carried twelve 4.1-inch guns and had two torpedo tubes. She burned both coal and oil.

Both ships have been very active in the Black Sea and have been reported in Russian dispatches as sunk or seriously injured on several occasions. A British official report told of dropping bombs on the *Sultan Selim* in July, 1917, with the result, it was said, that her injuries would keep her in port several months. Her inactivity since that time would indicate the correctness of this last report.

The Turkish Navy has suffered heavily during the war. The known losses are: Two battleships, two protected cruisers, ten gunboats, two torpedo-boat destroyers, three torpedo-boats and twenty-three supply ships and transports.—*Army and Navy Journal*, 26/1.

AIRMEN CONTINUE "GOEBEN" ATTACKS.—London, Wednesday.—Several attacks by day and night have been made by British naval airplanes on the cruiser *Goeben*, stranded in the Dardanelles, and two hits with heavy bombs were made, it was officially announced to-day. The announcement reads:

"Naval air service machines have made several day and night attacks on the *Goeben* and secured two hits with heavy bombs. They have also bombed one of the tugs which is secured alongside the *Goeben*. In every case heavy anti-aircraft gunfire was encountered, but all our machines returned safely.

"The attacks are continuing."—*N. Y. Herald*, 24/1.

The *Goeben* was floated and reached port.

PACIFIC

THE JAPANESE AT VLADIVOSTOCK.—No official announcement has been made with regard to this new development in the Far East. The only people who criticize it adversely are those who think that Germany will be sooner moved to practical repentance by the Allies assuming that she is a civilized nation than by teaching her that she is not one in the way she understands—that is to say, by force. That Japan's occupation of Vladivostock may not square with the letter of Allied professions may be true enough; but it certainly squares with their spirit, which, after all, is the chief thing. As for the contention that Russia is our ally, and that Japan by this action is violating the obligations of partnership, it is as if when a man's house is on fire his friends should refrain from saving as many of his goods as they could in case he might misconstrue their help. At present Russia is voiceless, except on a note that no one cares to hear except the enemy. Japan wisely cuts the far-fetched considerations of the "defeatists," and keeps guard in Vladivostock. She has several good reasons,

all of which are understood by the Allies. One is that the port is the Pacific terminus of the trans-Siberian railway, and as such is a great depot for vast quantities of munitions and other war material supplied by Britain, France and the United States for the use of Russia's armies. As the Bolshevik caricature of a government knows why they are not performing their share in the war, it cannot be permitted to inflict further loss upon the Allies by disposing of the war material at Vladivostock. Again, there is a large internment camp in the vicinity, the prisoners in which must not be permitted to escape. That Vladivostock may be turned into a base for enemy raiders and submarines in the Western Pacific is, too, a contingency, however remote, which must be provided against, and Japan is doing it in the only way possible. How could the situation be met in any other way?—*Army and Navy Gazette*, 22/12.

MORE ENTENTE WARSHIPS ARRIVE AT VLADIVOSTOK.—Five more Entente warships have arrived at Vladivostok, according to special dispatches from Petrograd. It is added that China, acting on allied advice, has forbidden exportation of foodstuffs to Russia.

The British embassy in Petrograd January 26 informed the Bolshevik Government that British warships were at Vladivostok to protect Allied subjects against possible disorder.—*Evening Star*, 1/2.

JAPANESE TROOPS LAND AT VLADIVOSTOK.—The *Naschivek*, formerly the *Retop*, asserts that a Japanese cruiser at Vladivostok has put troops ashore and that the Japanese consul there has issued a proclamation declaring that the Japanese soldiers are to keep order, owing to the danger threatening Japanese citizens. The proclamation of the consul adds that the soldiers have no other motives and no desire to interfere in Russian affairs.—*Evening Star*, 19/1.

CHINESE FIRE UPON GUNBOAT "MONOCACY."—The American gunboat *Monocacy* was fired upon by the Chinese 50 miles above Yochow, on the Yang-tse-Kiang. A sailor named O'Brien was killed and two other sailors were wounded.

The attack was made near Kien-Lih-Sien and came without warning. The attackers hid behind a dike on the north bank of the Yang-tse-Kiang. The gunboat returned the fire but with what result is not known. Afterward the *Monocacy* proceeded to Hankow.

The firing lasted for half an hour. It is presumed that the assailants were a detachment of the southern revolutionary forces.

The reason for the attack and details of it have not yet been received. Dr. Paul S. Reinsch, the American ambassador, will demand of the foreign office that responsibility for the attack be fixed and the offenders punished, and also that measures shall be taken to safeguard shipping. Dr. Reinsch does not believe that the attack indicates an anti-foreign feeling, but rather that it was intended to bring up complications for the central government.

The Japanese steamer *Tayuen* also was subjected to fusillades.

The commander of the American gunboat fired upon by Chinese rebels reported that he returned the fire and silenced it.

American Minister Reinsch's dispatches to the State Department to-day bearing on the attack on the *Monocacy*, contained no additional details to those already received in press dispatches. Minister Reinsch said he had already made representations to the Chinese Government.

Secretary Daniels gave out the following:

"On January 17, at 9 a. m., the United States gunboat *Monocacy*, while cruising about 50 miles above Yochow, on the Yang-tse-Kiang River, was fired on by intrenched Chinese, and was hit a number of times. H. L. O'Brien, chief yeoman, was fatally injured, and W. N. Donelly, seaman, slightly wounded. The fire was returned by the *Monocacy* and silenced.

"It is believed that the Chinese were bandits or revolutionists."—*Evening Star*, 22/1.

GENERAL NOTES

U-BOATS HAVE SUNK OVER 6,000,000 TONS.—*End of Year of German Frightfulness at Sea Shows Britain the Heaviest Loser.—Norway Leads Neutrals.—America's Loss Put at 69 Ships in the 12 Months of German Attack.*—A year ago the German Government decreed unrestricted submarine warfare against enemy and neutral merchant vessels. The decree read:

"From Feb. 1, 1917, sea traffic will be stopped with every available weapon and without further notice."

The danger zone around the British Isles, established in February, 1915, was enlarged and made to include the western Mediterranean. A prohibited zone was also established for hospital ships on the ground of the alleged misuse of these ships by the Allies.

The decree repudiated Germany's note to the United States of May 4, 1916, in which she promised henceforth to conduct her submarine campaign in accordance with the laws of nations—search and capture, and sinking only when the presence of contraband aboard had been proved and there was no opportunity to take the vessel to a home port and the safety of the personnel had been assured.

According to figures in the following tables, which are official unless otherwise designated, the total of tonnage lost of Allies and neutrals from January 1, 1917 to January 26, 1918, was 6,617,000 while in the same period (all official accounts either begin with the last week of February or combine January and February), the total number of British ships, exclusive of fishing craft, was 1169.

TONNAGE LOST BY ALLIES AND NEUTRALS

Month	
January 1 to February 25, 1917	812,000
March	600,000
April	788,000
May	549,000
June	758,000
July	463,000
August	591,000
September	*455,000
October	*470,000
November	*435,000
December	*388,000
To January 26, 1918	*308,000
Total	6,617,000

BRITISH LOSSES IN SHIPS

	Number ships
January 1 to February 25, 1917	140
Four weeks March	93
Five weeks April	185
Four weeks May	113
Five weeks June	110
Four weeks July	81
Five weeks August	104
Four weeks September	73
Five weeks October	87
Four weeks November	61
Four weeks December	70
To January 26, 1918	52
Total	1,169

* Estimated.

Aside from the belligerent, Great Britain, with a loss of 1169 ships, exclusive of fishing craft, Norway, a neutral, has been the heaviest loser.

On January 4, a Copenhagen dispatch announced that in 1917 Norwegian vessels with an aggregate tonnage of 566,000 were sunk. According to figures kept in the *Times* office 69 merchant vessels flying the American flag were also sunk in the same period.

The exact number of submarines which came to grief in their unrestricted campaign is not known, but, according to the State Department, the average sinkings of them for the first 11 months were 1.25 a day, or about 38 a month, while the German rate of construction had been .75 a day, or about 23 a month.

The visible falling off in the work of the submarine during the last three months is accounted for in three ways, each backed up by authoritative and sometimes official conjecture: That the protection offered convoys was growing more adequate; that the engines against the submarine were becoming more effective, particularly the "depth charge"; that many of the super-U-boats had been withdrawn either for refitting or on account of the debilitation of both officers and men.

It has been reported that mutinies at German naval bases have been caused by the enforced draft of men for submarine work. There is also the report that Germany is harboring her submarine strength for a monstrous campaign against American shipping, bearing troops and supplies abroad. Secretary Baker on January 27 predicted such a campaign in the words: "The most powerful submarine offensive hitherto undertaken may be expected."

With the reason given for the recent falling off in sinkings by U-boats, the requisitioning by the government of 426 ships, totaling more than week in June the total of British entrances and clearances reached the maximum for the year—28,204 ships. This figure has dropped steadily until the week of January 26, when the total was 4661. In the first week designated 130 British ships were sunk; in the second, only 21.

A dispatch from France on January 29 stated that 16 former German vessels, including the *Leviathan* (*Vaterland*) had just landed supplies and men in that country. By taking over German ships the United States has added 515,435 tons to her flag. A further offset to the Allies' loss of tonnage is the requisitioning by the government of 426 ships, totaling more than 2,000,000 gross tons, while contracts have been awarded for 884 ships.

Great Britain had in commission in August, 1914, 16,841,919 tons. She has added to this by construction: In 1915, 1,386,914; in 1916, 2,050,000; in 1917, 2,850,000, and by purchase during the whole foregoing period 80,000 tons, giving a net total of 23,208,433 tons. Of this it has been estimated that she has lost from all causes since the war began 9,116,914 tons, which should leave her in possession to-day of 14,091,514 tons which is only 2,750,000 tons less than what she had when the war began.

Sir Eric Geddes, the First Lord of the British Admiralty, announced in July that Great Britain had 15,000,000 tons afloat, and that the empire's building for the year would be over 2,800,000. Of the 6,000,000 tons contracted for by the United States, it was reported in Washington on January 13 that 327,150 tons requisitioned while under construction would be put into service before the end of March.—*N. Y. Times*, 2/1.

69 OF OUR SHIPS SUNK; 300 DROWNED.—*Official Record of a Year's Experience with German "Frightfulness."—Net Gain of 515,435 Tons by Seizure of German Craft—426 More Ships Requisitioned and 884 Are Being Built.*—In the 12 months of unrestricted warfare launched against American and allied shipping by Germany one year ago there have been sunk by submarines, mines and raiders 69 American vessels, totaling 171,061 gross tons, according to a careful compilation of records of sinkings which have been made public in the period.

Offsetting this loss of American vessels, most of which were sailing ships, the United States since February 1 has added to her merchant

marine by the seizure of former German and Austrian owned ships a total of 107 vessels having a gross tonnage of 686,494, leaving on the credit side of the American ledger in the account with the Central Powers a net gain of 515,435 gross tons. The loss of life caused by the sinking of the 69 American ships was more than 300 persons, however.

The percentage of sinkings of American ships compared with the number of vessels which have sailed through the war zone successfully is small. Records of the Department of Commerce show that for the period beginning February 1, 1917, and ended December 1, there were cleared from American ports in the foreign trade ships aggregating 17,738,900 tons net, or approximately 24,834,400 gross tons. The number of ships making up the total of tons was not made public by the department.

Further offsetting the loss of tonnage occasioned by the submarine warfare, the United States through the Shipping Board requisitioned in American shipyards 426 vessels totaling more than 2,000,000 gross tons, and contracts have been awarded for 884 ships, a large number of which are now under way and are being rushed to completion. In addition, the Shipping Board on October 15 last placed under government requisition 393 American vessels of more than 2500 tons deadweight capacity, which were afloat and immediately assigned them to the task of carrying supplies for the Allies and the American forces abroad.

Including in these requisitioned vessels were 21 ships in Great Lakes trade and in addition there were commandeered 24 steamers building on the lakes for a foreign account and ready for launching. Virtually all of these were brought to Atlantic coast ports and immediately put into service. Almost one-half of them had to be cut in two to get them through the Welland Canal, but the task was accomplished and the ships rejoined in less than three months from the time the contract was awarded.

Another difficulty which faced the United States in the task of putting to sea vessels to offset the ravages of the U-boats was the repairing of the "willful damage" done to the former German ships by their officers and crews before the ships were seized. This cost millions of dollars, and in many instances called for the highest engineering skill to make and replace parts of foreign-built engines and boilers removed or broken.

Indicating that the task has been attended by success, the statement was made to-day by a prominent official connected with the Shipping Board that every seized vessel was now completely repaired and in service. Many of them have made three and four round trips through the war zone.

Three of the former German vessels have been the objects of successful attack by the submarines. The *Actaeon*, formerly the *Adamsturm*, and the *Owasco*, formerly the *Allemannia*, were sunk and the *Armenia* was hit by a torpedo but was saved after being beached. Several other former German ships have been attacked, but escaped.

The announced sinkings of British ships for the year up to and including the week ended January 23 have been 1033 vessels, of which 763 were of more than 1000 tons, and 270 were under that figure. The joint losses of France and Italy have averaged three to four large vessels weekly.—*Washington Evening Star*, 2/1.

ASSERT SUBMARINES SANK 9,000,000 TONS.—The German newspapers assert that in the first year of the unrestricted submarine warfare 9,000,000 tons of Allied and neutral shipping were sunk, and that only 4,000,000 tons have been built to offset this.

As showing how unreliable is the information which the German authorities give out, the Associated Press is authorized to state that the figures put forward exaggerated the actual tonnage lost by more than 50 per cent.

The total net loss of the world's ocean-going tonnage since the beginning of the war, including the losses by marine risk as well as by enemy action, and allowing for enemy tonnage captured, amounts to less than 3,000,000, or 9 per cent of the tonnage available at the beginning of the war.

The semi-official *Norddeutsche Allgemeine Zeitung* and other Berlin newspapers publish articles on the anniversary of unrestricted submarine warfare. They glorify the U-boat as a "weapon which has achieved strategic and moral results, particularly against Great Britain in its world position."—*N. Y. Times*, 3/2.

THE SUBMARINE WAR.—*Secretary Daniels Expects a Continuing Fight, With Losses to Both Sides.*—Washington, January 28.—Prospects of concentrated effort on the part of German submarines to break down the transatlantic line of communication to the American expeditionary forces predicted to-day in the weekly review of the War Department has been foreseen also, but navy officials, it was learned to-night, believe the imminent offensive to be only the usual activities which has always succeeded a lull in submarine warfare.

Secretary Daniels, in reply to questions, said to-day that the navy expects a "continuing fight" with the submarines, with losses to both sides expected. He expressed the belief, however, that new weapons now in use will make such operations increasingly costly to the German Admiralty.—*Baltimore American*, 29/1.

THIRD OF U-BOATS LOST IN 10 MONTHS.—*Germans Fear Depth Bombs, Says Engineer from Kiel.*—Geneva, Switzerland, February 16.—A Swiss engineer employed for the last 10 months at the electrical works at Kiel and who has recently returned, informs the Associated Press that the Germans are making every effort to conceal their submarine losses, especially from the navy, because of increased difficulty in mustering crews. He estimates the Germans lost 30 per cent of their submarines during the time that he was at Kiel.

"I saw a score of submarines lined up in the canal undergoing repairs," he said. "They had been hit by depth bombs, which the Germans seem to fear greatly."

The engineer added that there had been two serious mutinies at Kiel during 1917.—*Washington Post*, 17/2.

U-BOATS SUNK AS FAST AS GERMANY CAN BUILD THEM.—*Back from the Front, Representative Miller Makes Encouraging Report to House.*—Washington, D. C., Tuesday.—Representative Miller, who recently went to the front in France, told the House to-day that he believed German submarines are being destroyed nearly as rapidly as Germany can build them.

He praised Vice Admiral Sims for the methods he had adopted with American destroyers and cruiser convoys to combat the submarine menace, and argued that American shipping should be handled by naval officers and not by the Shipping Board. There were no Americans in the crews of the two transports aboard which he crossed the Atlantic, he said.

Mr. Miller said that during the last 10 months three times as many submarines have been destroyed as were destroyed during the previous two and a half years.—*N. Y. Herald*, 6/2.

ONLY 30 U-BOATS NOW IN WAR ZONE.—A correspondent of the Associated Press, recently returned from Europe, is authority for the statement that the number of German submarines operating in the prohibited zone had until recently been surprisingly small.

During the early period of the winter the number of submarine raiders at work in the zone varied from 12 to a maximum of 18. It was then expected, however, that the Germans would endeavor to increase this number, largely as a threat to the American troop transports, and that they might by this time be able to increase this maximum perhaps to 30 boats. These estimates did not include the smaller "egg planters" or mine-laying submarines.

The most formidable German submarines of which there is any definite record were armed with the new German 15-centimeter (5.9 inches) gun brought out in the war, which is a more powerful, longer-ranged gun than the 15-centimeter gun mounted in the main batteries of the German light cruisers at the outbreak of the war. The newest submarines carried two of these guns, forward and aft.

Much has been heard in the press, neutral and belligerent, of giant 5000-ton "submersible cruisers," but none of these had been identified definitely, according to the latest information in possession of the correspondent, nor had there been any trustworthy news from Germany that the Admiralty was laying down any boats of a tonnage representing such a jump from the size of the most modern submarine operating in the late summer and autumn.

The numerical production of submarines in Germany at that time had fallen off decidedly, due in part perhaps to difficulties with raw material, but chiefly to a decision to suspend the manufacture of small submarines of the "canal" type.

These boats, small enough to proceed to the sea through the canals of Belgium, had been built in comparatively large numbers in series production all over Germany and shipped to salt water, but were found to be too small for effective use under present conditions in the war zone, where destroyers and armed patrol boats compel the representatives of ruthlessness to operate chiefly submerged and to carry armament heavy enough to outrange the light guns on the armed merchantmen.

German experts believed, in fact, that a serious mistake had been made in designing and constructing these craft.—*Nautical Gazette*, 14/2.

DISCONTENT IN GERMAN FLEET.—London, January 25.—A German naval engineer with the rank of lieutenant, who has deserted from Kiel, according to an Amsterdam dispatch to the *Daily Express*, states that dissatisfaction among the men of the German fleet is much more serious than in the army. He asserts there have been important revolts, generally among the crews of mine sweepers.

Three weeks ago a squadron of mine sweeping trawlers entered Hamburg after an expedition in which three men were lost in an encounter with the British, and one of the trawlers was damaged. Before the men were permitted to go ashore, according to this account, they were notified that they must report back for duty within an hour. They asked time for rest. The Hamburg commandant refused, whereupon 150 men declined to obey the order.

An hour later a a lieutenant named Wagner arrived and ordered the men to return to their boats. They refused. The lieutenant swore at the men and struck two of them, the dispatch continues. He was thrown into the water and left to drown.

The commandant who had watched the mutiny dispatched a motorboat carrying two machine guns which were fired into the crowd of sailors, killing 44 and wounding 73. The others were arrested and sentenced to terms of imprisonment varying from 5 to 20 years.—*Washington Evening Star*, 28/1.

THE GERMAN REVOLT.—It is undoubtedly premature to look for the collapse of the German military program because of the internal troubles now prevalent in the empire. Strikers may have quit work by the hundreds of thousands, tying up important industries and spreading disaffection among the people. But the German Government is not impotent to cope with such a strain. It still has the army at command to put down revolt and it will probably do so.

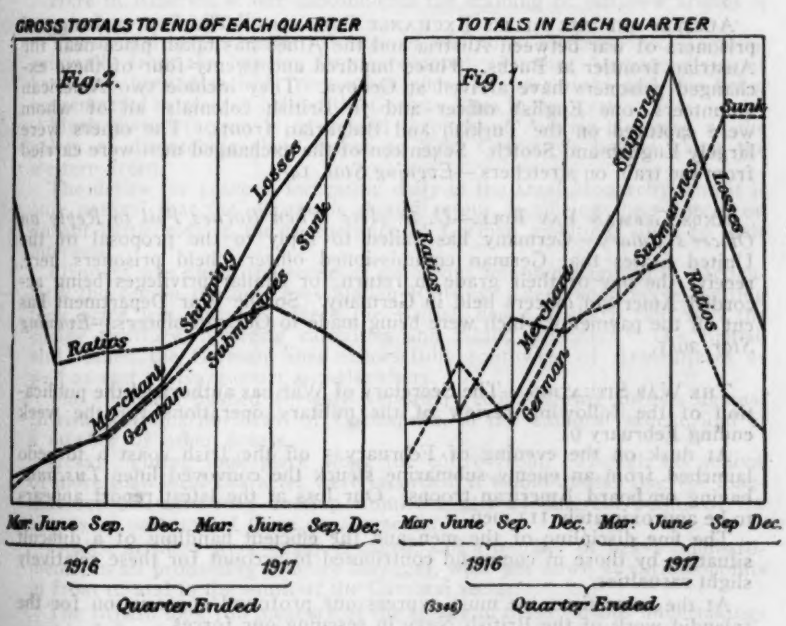
Indeed, it would not be desirable, from the point of view of the Allied nations, for the present strikes to bring the German Government to the point of peacemaking. There is in this outbreak of discontent not yet

a symptom of revolution against the dynastic rule, no protest against the mode of autocratic government. Not until the German people are at the point of refusal to follow longer the lead of irresponsible rulers will the spirit of conquest that is the root of the evil of to-day be broken.

Repression by force of arms may come in Germany in the immediate crisis. In one respect it is to be hoped for by the enemies of Germany. For repression will not allay the sentiment for peace and bring alleviation of intolerable conditions. It will merely postpone the day of final reckoning and intensify the bitterness felt by the people. When the revolt that the government at Berlin must eventually meet comes it will be the more determined for any severities that may now be practiced.

There is great encouragement for the Allies in the fact that this first protest on a large scale against the German military program has gone so far and involved such a large number of workers. It indicates that the leaven of free thought is working in the lump. Doubtless this is a direct result of the negotiations with Russia and the opening of the gates to the infusion of Bolshevik ideas into Germany. Russia may still be Germany's Nemesis.—*Evening Star*, 1/2.

SUBMARINE WAR.—*To the Editor of Engineering. Sir.*—The interesting charts supplied by the naval authorities, published on page 670 of your issue



of December 21, showing the losses by enemy action of merchant tonnage (British, allied and neutral) and the German submarines sunk during each quarter, are shown together in Fig. 1. The former is the full line and the latter the dotted line.

Although the scales of the ordinates in both cases are not marked yet, assuming that they are to scale, the ratios of the ordinates of German submarines sunk to those for merchant shipping losses are obtainable.

These are shown in the dot-dash line and indicate that the best relative results have been obtained in the last quarter.

By adding the ordinates for each quarter the gross totals to the end of each quarter have been obtained. These are shown in Fig. 2, and indicate that the merchant tonnage losses have been increasing in a *decreasing* ratio since the June, 1917, quarter, while the German submarines sunk have been increasing in an *increasing* ratio since September, 1916.

The ratio curve indicates that the general trend from June, 1916, to June, 1917, was against us, but has now been reduced to about that of September, 1916.

Yours faithfully,

HENRY G. LLOYD, M. Inst. C. E.

44 Guilford avenue, Surbiton, December 24, 1917. —*Engineering*, 4/1.

LOOKOUTS IN THE SUBMARINE ZONE.—A recent Admiralty order requires that all British merchant vessels of 2500 tons gross and upwards shall include in their crew four men, specially engaged, who are to act as lookouts at the mastheads. In the submarine zone, these men are to be employed solely on their special duty, keeping watch in four watches, each to be of not more than two hours' duration. They must obtain a Board of Trade certificate as to their eyesight; and they will receive extra pay whilst in the submarine zone.—*Scientific American*, 9/2.

AUSTRIA AND THE ALLIES EXCHANGE PRISONERS.—The first exchange of prisoners of war between Austria and the Allies has taken place near the Austrian frontier at Buchs. Three hundred and twenty-four of these exchanged prisoners have arrived at Geneva. They include two American volunteers, one English officer and 70 British colonials, all of whom were captured on the Turkish and Bulgarian fronts. The others were largely English and Scotch. Seventeen of the exchanged men were carried from the train on stretchers.—*Evening Star*, 14/2.

ENDS GERMAN PAY ROLL.—*U. S. Acts When Boches Fail to Reply on Officer's Salary.*—Germany has failed to reply to the proposal of the United States that German commissioned officers, held prisoners here, receive the pay of their grade in return for similar privileges being accorded American officers held in Germany. So the War Department has cut off the payments which were being made to German officers.—*Evening Star*, 29/1.

THE WAR SITUATION.—The Secretary of War has authorized the publication of the following review of the military operations for the week ending February 9:

At dusk on the evening of February 5 off the Irish coast a torpedo launched from an enemy submarine struck the convoyed liner *Tuscania*, having on board American troops. Our loss at the latest report appears to be approximately 113 men.

The fine discipline of the men and the efficient handling of a difficult situation by those in command contributed to account for these relatively slight casualties.

At the same time, we must express our profound appreciation for the splendid work of the British Navy in rescuing our forces.

Notwithstanding the fact that hostile submarines were lurking in the vicinity, the British destroyers rendered every assistance and remained on the scene, succoring our men until all survivors were brought safely ashore.

At the small ports of Ireland and Scotland where our troops were landed they met with a most warmhearted reception on the part of the people, who did all in their power to administer every comfort and care.

The sector in Lorraine where our forces are in contact with the enemy continued relatively active throughout the week. Artillery duels took place intermittently, but fog and heavy rains prevented infantry engagements. The Germans attempted no further raids and settled down to systematic sniping and bombing of our positions.

Our sharpshooters gave a good account of themselves, keeping the enemy parapets well cleared of Germans.

One stretch of our line is very close up to the German position. Here bombing and a frequent exchange of hand grenades occurred.

German aeroplanes made repeated attempts to push their reconnoitering sallies over our lines, but were invariably met with a hot fire from our anti-aircraft guns.

Our forces engaged have shown themselves well fitted for their tasks in the trenches and are rapidly becoming accustomed to the routine of trench warfare. The welfare of our troops, whether in the trenches or in rest depots, is the object of the immediate personal concern of all our commanders. The rations for the men in the trenches, in spite of the enemy's attempts to break up our transport columns, have been regularly assured. The care of the wounded at our field dressing stations, as well as at our base hospitals, is being carried on with efficiency and scientific skill.

Here in America at our cantonments the training of our new armies is proceeding methodically.

The arrival in the western theater of additional German forces coming originally from the Russian front are noted. Further Austrian divisions have also been detached from other zones of operations and are being concentrated in reserve behind the German lines in the west.

Much dissatisfaction is expressed throughout Austria-Hungary at the policy of dispatching their troops to fight Germany's battles along the western front.

The desire for peace is increasing daily in the Dual Monarchy, and it is only natural that the Austrians should resent sacrificing their forces on distant battlefields in the furtherance of German ambitions alien to their interests.

Flanders was again the scene of numerous minor engagements, particularly the region of the Ypres-Staden Railway, where such fierce fighting took place last autumn. Here the British drove a sharp raid into the enemy territory, inflicting casualties and taking prisoners. The British also raided the German lines successfully southwest of Armentieres as well as east of Hargicourt and elsewhere.

The Germans pushed forward repeated reconnoitering thrusts against British positions northeast of Poelcapelle, in the Cambrai salient, and at a number of other points.

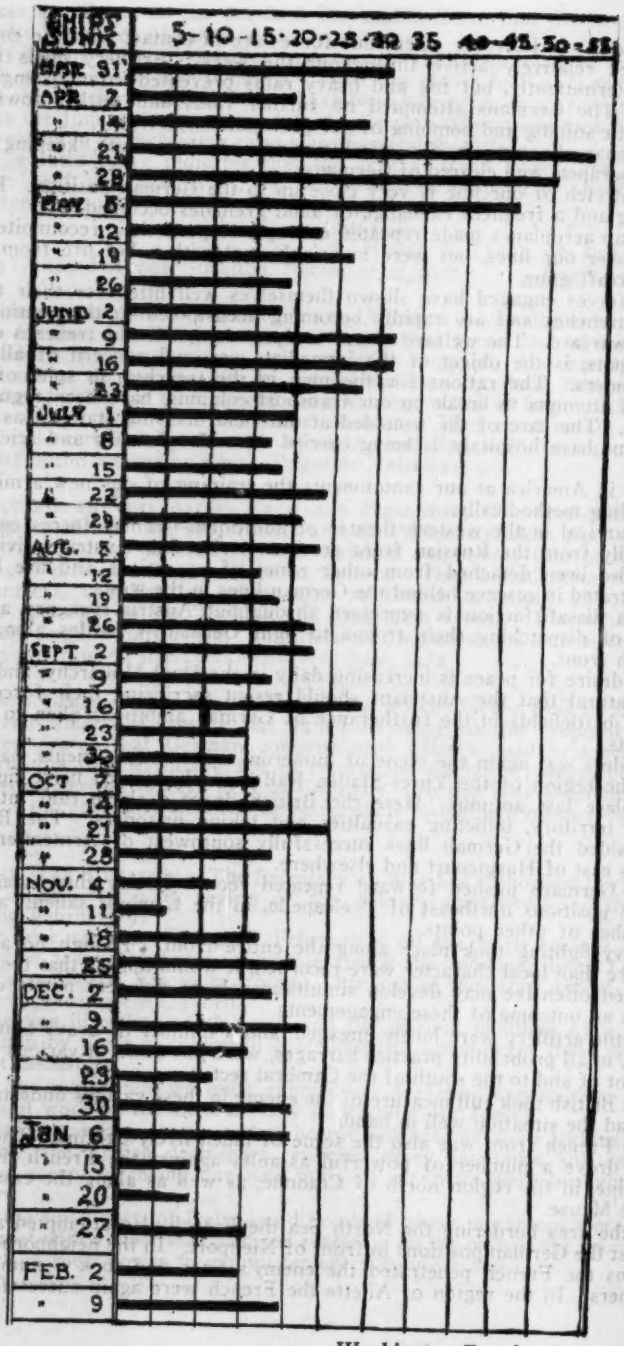
Heavy fighting took place along the entire front. Though no actions of more than local character were recorded, it would appear that the long-deferred offensive may develop simultaneously at different points of the line as an outcome of these engagements.

Hostile artillery were busily engaged, and a number of heavy bombardments, in all probability practice barrages, were put down at various points in front of and to the south of the Cambrai sector.

The British took full measure of the enemy in these various undertakings and had the situation well in hand.

The French front was also the scene of much lively fighting. The Germans drove a number of powerful assaults against the French lines in Lorraine, in the region north of Craonne, as well as along the east bank of the Meuse.

In the area bordering the North Sea the French also attempted a blow against the German positions in front of Nieuport. In the neighborhood of Rheims the French penetrated the enemy's lines and took a number of prisoners. In the region of Ailette the French were again successful and



—*Washington Evening Star*, 31/1.

captured the entire detachment of a German outpost. North of the Chemin des Dames and near Flirey the enemy drove forward raiding parties, but achieved no results.

Artillery bombardments took place over an extended front and, while less violent than in the British areas, nevertheless were of greater magnitude than during the preceding week. Hostile fire was particularly intense along the east bank of the Meuse and in upper Alsace.

The French and British carried out a series of very effective air raids; the French dropping many tons of high explosives on munition plants in Alsace, while the British concentrated their energies on bombing the submarine nests at Ostend and Zeebrugge and hostile aerodomes in the zone of operations.

In the Italian theater no important operations took place. The Austrians were busy rearranging their dispositions of units along the front, and the Italians kept up a continuous harassing bombardment of the entire enemy line. Italian patrols were alert in the region of the headwaters of the Brenta. Northeast of the Monte Grappa minor encounters took place.

The enemy unsuccessfully attempted to explode mines in the Monte Pasubio sector. In the Val Lagarina, and especially along the Lower Piave, artillery duels were very lively.

Austrians are continuing their policy of bombing the open towns of the Venetian Plain. The priceless art treasures of Padua, Bassano, Treviso, etc., religiously respected through all other campaigns in Italy, were during the week the targets of Austrian aviators.

The British in Palestine have advanced their lines slightly north of Jerusalem.—*Army and Navy Register*, 16/2.

INDEX OF WAR VESSEL LOSSES MENTIONED IN THIS NUMBER

NOTE.—A complete table of losses since the beginning of the war will be published semi-annually; the latest appears in the January number of the PROCEEDINGS.

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DIPLOMATIC NOTES

FROM JANUARY 18 TO FEBRUARY 18

PREPARED BY

ALLEN WESTCOTT, PH. D., Instructor, U. S. Naval Academy

LONG RANGE NEGOTIATIONS BETWEEN BELLIGERENTS

During the month ending February 18, the spokesmen of the warring powers continued the process—a noteworthy innovation and advance—of negotiations by public manifestoes without cessation of hostilities. In reply to the specific program of 14 points set forth by President Wilson on January 8, the German Chancellor and the Austro-Hungarian Foreign Minister addressed delegates of their respective Parliaments two weeks later (January 24). In subsequent comment on these replies (February 11), President Wilson stated that he found that of Count Czernin "friendly in tone," that of Count von Hertling "very vague and very confusing." In effect, the German Chancellor insisted that every territorial problem should be settled, not in general council, but in separate negotiations with the nations particularly concerned. Thus, as in the case of Russia, the Central Powers would secure the advantage of dealing severally with the weaker members of the Entente.

COUNT VON HERTLING'S STATEMENT.—In his speech before the Main Committee of the Reichstag on January 24, Count von Hertling maintained a truculent attitude. He declared that the allies spoke as "victors to vanquished" and "still cast covetous eyes on parts of our territories," that "Germany's military position was never so favorable as it now is," and that "if the leaders of the enemy powers really are inclined to peace, let them revise their program once again."

After an extended German version of international relations preceding the war and German claims in Alsace-Lorraine, the Chancellor discussed President Wilson's program, point by point, as follows:

[Note: President Wilson's address of January 8 appears in full in the February PROCEEDINGS.]

"The first point is the demand that there shall be no more secret international agreements. History shows that it is we above all others who would be able to agree to the publicity of diplomatic documents. I recall that our defensive alliance with Austria-Hungary was known to the whole world from 1888, while the offensive agreement of the enemy states first saw the light of publicity during the war, through the revelations of the secret Russian archives. The negotiations at Brest-Litovsk are being conducted with full publicity. This proves that we are quite ready to accept this proposal and declare publicity of negotiations to be a general political principle.

"In his second point Mr. Wilson demands freedom of shipping on the seas in war and peace. This also is demanded by Germany as the first and one of the most important requirements for the future. Therefore, there is here no difference of opinion. The limitation introduced by Mr. Wilson at the end, which I need not quote textually, is not intelligible, appears superfluous and would therefore best be left out."

[The limiting clause reads "except as the seas may be closed in whole or in part by international action for the enforcement of international covenants."]

"It would, however, be highly important for the freedom of shipping in future if strongly fortified naval bases on important international routes, such as England has at Gibraltar, Malta, Aden, Hong Kong, the Falkland Islands, and many other places, were removed.

"Point 3: We, too, are in thorough accord with the removal of economic barriers which interfere with trade in a superfluous manner. We, too, condemn economic war, which would inevitably bear within it causes of future warlike complications.

"Point 4: Limitation of armaments: As already declared by us, the idea of limitation of armaments is entirely discussable. The financial position of all European States after the war might most effectively promote satisfactory solution. [Cries of 'Hear! Hear!'] It is therefore clear that an understanding might be reached without difficulty on the first four points of Mr. Wilson's program.

"I now come to the fifth point—settlement of all colonial claims and disputes. Practical realization of Mr. Wilson's principles in the realm of reality will encounter some difficulties in any case. I believe that for the present it may be left for England, which has the greatest colonial empire, to make what she will of this proposal of her ally. This point of the program also will have to be discussed in due time, on the reconstitution of the world's colonial possessions, which we also demand absolutely.

"Point 6: Evacuation of Russian territory: Now that the Entente has refused, within the period agreed upon by Russia and the Quadruple Alliance, to join in the negotiations, I must in the name of the latter decline to allow any subsequent interference. We are dealing here with questions which concern only Russia and the four allied powers. I adhere to the hope that, with recognition of self-determination for the peoples on the western frontier of the former Russian Empire, good relations will be established, both with these peoples and with the rest of Russia, for whom we wish most earnestly a return of order, peace, and conditions guaranteeing the welfare of the country.

"Point 7: Belgium: My predecessors in office repeatedly declared that at no time did the annexation of Belgium to Germany form a point in the program of German policy. The Belgian question belongs to those questions the details of which are to be settled by negotiation at the peace conference. So long as our opponents have unreservedly taken the standpoint that the integrity of the allies' territory can offer the only possible basis of peace discussion, I must adhere to the standpoint hitherto always adopted and refuse the removal in advance of the Belgian affair from the entire discussion.

"Point 8: The occupied parts of France are a valuable pawn in our hands. Here, too, forcible annexation forms no part of the official German policy. The conditions and methods of procedure of the evacuation, which must take account of Germany's vital interests are to be agreed upon between Germany and France.

"I can only again expressly accentuate the fact that there can never be a question of the dismemberment of imperial territory. Under no fine phrases of any kind shall we permit the enemy again to take from us territory of the empire which with ever-increasing intimacy has linked itself to Germanism, which has in highly gratifying manner ever and increasingly developed in an economic respect, and of whose people more than 87 per cent speak the German mother tongue.

"The questions dealt with by Mr. Wilson under points 9, 10, and 11 touch both the Italian frontier question and questions of the future development of the Austro-Hungarian monarchy and the future of the Balkan States; questions in which, for the greater part, the interests of our ally, Austria-Hungary, preponderate. Where German interests are concerned we shall defend them most energetically.

"But I may leave the answer to Mr. Wilson's proposals on these points in the first place to the Austro-Hungarian Foreign Minister. Close contact with the allied dual monarchy forms the kernel of our present policy, and must be the guiding line in the future. Loyal comradeship in arms, which has stood the test so brilliantly in wartime, must continue to have its effect in peace. We shall thus on our part do everything for the attainment of peace by Austria-Hungary which takes into account her just claims.

"The matters touched upon by Mr. Wilson in point 12 concern our loyal, brave ally, Turkey. I must in nowise forestall her statesmen in their attitude. The integrity of Turkey and the safeguarding of her capital, which is connected closely with the question of the Straits, are important and vital interests of the German Empire, also. Our ally can always count upon our energetic support in this matter.

"Point 13 deals with Poland. It was not the Entente—which had only empty words for Poland and before the war never interceded for Poland with Russia—but the German Empire and the Austro-Hungarian monarchy which liberated Poland from the Czaristic régime which was crushing her national characteristics. It may thus be left to Germany and Austria-Hungary and Poland to come to an agreement on the future constitution of this country. As the negotiations and communications of the last year prove, we are on the road to this goal.

"The last point, the 14th, deals with a bond of the nations. Regarding this point, I am sympathetically disposed, as my political activity shows, toward every idea which eliminates for the future a possibility or a probability of war, and will promote a peaceful and harmonious collaboration of nations. If the idea of a bond of nations, as suggested by President Wilson, proves on closer examination really to be conceived in a spirit of complete justice and complete impartiality toward all, then the Imperial Government is gladly ready, when all other pending questions have been settled, to begin the examination of the basis of such a bond of nations."

SCHEIDEMANN FOR PEACE BY AGREEMENT.—Replying to and criticising Count von Hertling's statement to the Main Committee, the Socialist leader Philip Scheidemann asserted that agreement was possible in at least 11 points of President Wilson's program. "Two chief arguments," he said: "were advanced by the military party for the prolongation of the war, namely, the success of the U-boats and the strength of our army. But these were to have given us a decisive victory in six months, according to the announcement made in 1916. Alas, that period has long since passed, and while the U-boat has admittedly harmed England enormously, its chief visible effect has been the entry of America into the war. If the United States had not entered the war we may be sure the Russian revolution would long ago have brought a general peace.

"What about the army? Suppose the army should capture Calais and Paris; would that mean peace? I say 'No!' Suppose the army conquered France and England; would that mean peace? I say 'No!' for we would still have to conquer America."

Herr Scheidemann fiercely attacked the militarist leaders, asserting that their attitude toward Austria was likely to lose for Germany her last friend.

"If our government leaders cannot free us from these 'patriots,'" said the Social Democratic leader, "they had better go. I warn them that if they do not bring us peace with Russia they will be hurled from power."

Herr Scheidemann held that an agreement was easily possible on 11 points of President Wilson's statement.

"But Mr. Wilson must be told plainly," the speaker said, "that Alsace is Germany's and will remain so. If one clear word is spoken regarding Belgium, England's war mongering will end. An honorable, complete reinstatement of Belgium is our duty.

"I cannot see the day," Herr Scheidemann went on, "when Germany will say to the Entente: 'We accept your terms. We are beaten.' But just as little can I see the day when England, France and the United States will say the same to us."—*N. Y. Times*, 27/1.

COUNT CZERNIN'S STATEMENT.—In his speech on January 24, before the Foreign Affairs Committee of the Hungarian Parliament, Count Czernin dealt chiefly with the prospects of peace with Russia, affirming that Austria, for her part, sought neither "a square meter nor a kreutzer from the Russians." His comment on the allies' peace terms was at first reported as follows:

"I think there is no harm in stating that I regard the recent proposals of President Wilson as an appreciable approach to the Austro-Hungarian point of view, and that to some of them Austria-Hungary joyfully could give her approval. But she must first lay down the principle—that in so far as these propositions concern her allies, whether in the case of Germany's possession of Belgium or in the case of Turkey, Austria-Hungary, faithful to her engagements to fight to the end in defence of her allies, will defend the possessions of her war allies as she would her own. That is the standpoint of our allies, in regard to which there is perfect reciprocity."

Count Czernin said as to the second point in President Wilson's peace aims, freedom of the seas, the President had responded to the views of all and that he (Czernin) absolutely and entirely supported this paragraph. Regarding paragraph 3 in President Wilson's proposals—the removal of economic barriers and the establishment of equality of trade conditions—Count Czernin said:

"This article, which pronounces in a formal manner hostility against a future economic war, is so just and reasonable, and its application so often has been urged by us, that we have nothing to add to it."

According to later reports, this early version was garbled. Count Czernin did not refer to Belgium as a *German possession*, and expressed a willingness on the part of Austria to fight only for the *pre-war* possessions of her allies. This vital section of his speech should read as follows:

"So far as these propositions concern her allies, whether in the case of German possessions, Belgium, or Turkey, Austria-Hungary, faithful to her engagements, will go to the extreme in defence of her allies. She will defend the pre-war possessions of her allies as she would her own."

SUPREME WAR COUNCIL ON GERMAN TERMS.—The Supreme War Council of the allies, which met at Versailles, made this official announcement in London on February 3, after its final session for the present:

"The council was unable to find in Count von Hertling's and Count Czernin's recent utterances any real approximation to the moderate conditions laid down by the Allied Governments. Under the circumstances, the council decided that the only task before them to meet was the vigorous and effective prosecution of the war until the pressure of that effort produced a change of temper in the enemy governments justifying the hope of the conclusion of peace based on the principles of freedom, justice, and respect for international law. The council arrived at a complete unanimity of policy on measures for the prosecution of the war."

Generals Tasker H. Bliss, chief of staff, and John J. Pershing, U. S. A., represented our government at the meeting.

PRESIDENT WILSON'S REVIEW OF PEACE TERMS.—President Wilson in an address to Congress on February 11, analyzed the replies of the Central Powers and again outlined the conditions essential to an acceptable peace. He refused to accept Count von Hertling's proposal to confine territorial settlements to the countries immediately concerned. He pointed out that if territorial questions were so settled by separate bargains, separate economic and trade compacts would also be in order. In conclusion he laid down four general principles, requiring in substance that all territorial settlements should be made with the utmost regard for the national aspirations and the benefit of the populations concerned. The address follows in full:

Gentlemen of the Congress:

On January 8 I had the honor of addressing you on the objects of the war as our people conceive them. The Prime Minister of Great Britain had spoken in similar terms on January 5. To these addresses the German Chancellor replied on January 24, and Count Czernin for Austria on the same day. It is gratifying to have our desire so promptly realized that all exchanges of view on this great matter should be made in the hearing of all the world.

Count Czernin's reply, which is directed chiefly to my own address on January 8, is uttered in a very friendly tone. He finds in my statement a sufficiently encouraging approach to the views of his own government to justify him in believing that it furnishes a basis for a more detailed discussion of purposes by the two governments.

He is represented to have intimated that the views he was expressing had been communicated to me beforehand and that I was aware of them at the time he was uttering them; but in this I am sure he was misunderstood. I had received no intimation of what he intended to say. There was, of course, no reason why he should communicate privately with me. I am quite content to be one of his public audience.

Count von Hertling's reply is, I must say, very vague and very confusing. It is full of equivocal phrases and leads it is not clear where. But it is certainly in a very different tone from that of Count Czernin, and apparently of an opposite purpose. It confirms, I am sorry to say, rather than removes the unfortunate impression made by what we had learned of the conferences at Brest-Litovsk.

His discussion and acceptance of our general principles lead him to no practical conclusions. He refuses to apply them to the substantive items which must constitute the body of any final settlement. He is jealous of international action and of international council. He accepts, he says, the principle of public diplomacy, but he appears to insist that it be confined, at any rate in this case, to generalities, and that the several particular questions of territory and sovereignty, the several questions upon whose settlement must depend the acceptance of peace by the 23 states now engaged in the war, must be discussed and settled, not in general council, but severally by the nations most immediately concerned by interest or neighborhood.

He agrees that the seas should be free, but looks askance at any limitation to that freedom by international action in the interest of the common order. He would without reserve be glad to see economic barriers removed between nation and nation, for that could in no way impede the ambitions of the military party, with whom he seems constrained to keep on terms. Neither does he raise objection to a limitation of armaments. That matter will be settled of itself, he thinks, by the economic conditions which must follow the war. But the German colonies, he demands, must be returned without debate. He will discuss with no one but the representatives of Russia what disposition shall be made of the peoples and the lands of the Baltic provinces; with no one but the Government of France the "condi-

tions" under which French territory shall be evacuated; and only with Austria what shall be done with Poland.

In the determination of all questions affecting the Balkan States he defers, as I understand him, to Austria and Turkey; and with regard to the agreements to be entered into concerning the non-Turkish peoples of the present Ottoman Empire, to the Turkish authorities themselves. After a settlement all around, effected in this fashion, by individual barter and concession, he would have no objection, if I correctly interpret his statement, to a league of nations which would undertake to hold the new balance of power steady against external disturbance.

It must be evident to every one who understands what this war has wrought in the opinion and temper of the world that no general peace, no peace worth the infinite sacrifices of these years of tragical suffering, can possibly be arrived at in any such fashion. The method the German Chancellor proposes is the method of the Congress of Vienna. We cannot and will not return to that.

What is at stake now is the peace of the world. What we are striving for is a new international order based upon broad and universal principles of right and justice—no mere peace of shreds and patches. Is it possible that Count von Hertling does not see that, does not grasp it, is, in fact, living in his thought in a world dead and gone? Has he utterly forgotten the Reichstag resolutions of July 19, or does he deliberately ignore them? They spoke of the conditions of a general peace, not of national aggrandizement or of arrangements between state and state.

The peace of the world depends upon the just settlement of each of the several problems to which I adverted in my recent address to the Congress. I, of course, do not mean that the peace of the world depends upon the acceptance of any particular set of suggestions as to the way in which those problems are to be dealt with. I mean only that those problems each and all affect the whole world; that unless they are dealt with in a spirit of unselfish and unbiased justice, with a view to the wishes, the natural connections, the racial aspirations, the security and peace of mind of the peoples involved, no permanent peace will have been attained.

They cannot be discussed separately or in corners. None of them constitutes a private or separate interest from which the opinion of the world may be shut out. Whatever affects the peace affects mankind, and nothing settled by military force, if settled wrong, is settled at all. It will presently have to be reopened.

Is Count von Hertling not aware that he is speaking in the court of mankind, that all the awakened nations of the world now sit in judgment on what every public man, of whatever nation, may say on the issues of a conflict which has spread to every region of the world? The Reichstag resolutions of July themselves frankly accepted the decisions of that court. There shall be no annexations, no contributions, no punitive damages. Peoples are not to be handed about from one sovereignty to another by an international conference or an understanding between rivals and antagonists. National aspirations must be respected; peoples may now be dominated and governed only by their own consent. "Self-determination" is not a mere phrase. It is an imperative principle of action, which statesmen will henceforth ignore at their peril.

We cannot have general peace for the asking or by the mere arrangements of a peace conference. It cannot be pieced together out of individual understandings between powerful states. All the parties to this war must join in the settlement of every issue anywhere involved in it, because what we are seeking is a peace that we can all unite to guarantee and maintain, and every item of it must be submitted to the common judgment whether it be right and fair, an act of justice, rather than a bargain between sovereigns.

The United States has no desire to interfere in European affairs or to act as arbiter in European territorial disputes. She would disdain to take

advantage of any internal weakness or disorder to impose her own will upon another people. She is quite ready to be shown that the settlements she has suggested are not the best or the most enduring. They are only her own provisional sketches of principles, and of the way in which they should be applied.

But she entered this war because she was made a partner, whether she would or not, in the sufferings and indignities inflicted by the military masters of Germany against the peace and security of mankind; and the conditions of peace will touch her as nearly as they will touch any other nation to which is intrusted a leading part in the maintenance of civilization. She cannot see her way to peace until the causes of this war are removed, its renewal rendered, as nearly as may be, impossible.

This war had its roots in the disregard of the rights of small nations and of nationalities which lacked the union and the force to make good their claim to determine their own allegiances and their own forms of political life. Covenants must now be entered into which will render such things impossible for the future; and those covenants must be backed by the united force of all the nations that love justice and are willing to maintain it at any cost.

If territorial settlements and the political relations of great populations which have not the organized power to resist are to be determined by the contracts of the powerful governments which consider themselves most directly affected, as Count von Hertling proposes, why may not economic questions also? It has come about in the altered world in which we now find ourselves that justice and the rights of peoples affect the whole field of international dealing as much as access to raw materials and fair and equal conditions of trade.

Count von Hertling wants the essential bases of commercial and industrial life to be safeguarded by common agreement and guarantee, but he cannot expect that to be conceded him if the other matters to be determined by the articles of peace are not handled in the same way as items in the final accounting. He cannot ask the benefit of common agreement in the one field without according it in the other. I take it for granted that he sees that separate and selfish compacts with regard to trade and the essential materials of manufacture would afford no foundation for peace. Neither, he may rest assured, will separate and selfish compacts with regard to provinces and peoples.

Count Czernin seems to see the fundamental elements of peace with clear eyes, and does not seek to obscure them. He sees that an independent Poland, made up of all the indisputably Polish peoples who lie contiguous to one another, is a matter of European concern, and must, of course, be conceded; that Belgium must be evacuated and restored, no matter what sacrifices and concessions that may involve; and that national aspirations must be satisfied, even within his own empire, in the common interest of Europe and mankind.

If he is silent about questions which touch the interest and purpose of his allies more nearly than they touch those of Austria only, it must, of course, be because he feels constrained, I suppose, to defer to Germany and Turkey in the circumstances. Seeing and conceding, as he does, the essential principles involved and the necessity of candidly applying them, he naturally feels that Austria can respond to the purpose of peace as expressed by the United States with less embarrassment than could Germany. He would probably have gone much further had it not been for the embarrassments of Austria's alliances and of her dependence upon Germany.

After all, the test of whether it is possible for either government to go any further in this comparison of views is simple and obvious. The principles to be applied are these:

First—That each part of the final settlement must be based upon the essential justice of that particular case and upon such adjustments as are most likely to bring a peace that will be permanent.

Second—That peoples and provinces are not to be bartered about from sovereignty to sovereignty as if they were mere chattels and pawns in a game, even the great game, now forever discredited, of the balance of power; but that,

Third—Every territorial settlement involved in this war must be made in the interest and for the benefit of the populations concerned, and not as a part of any mere adjustment or compromise of claims among rival states; and,

Fourth—That all well-defined national aspirations shall be accorded the utmost satisfaction that can be accorded them without introducing new or perpetuating old elements of discord and antagonism that would be likely in time to break the peace of Europe, and consequently of the world.

A general peace erected upon such foundations can be discussed. Until such a peace can be secured we have no choice but to go on. So far as we can judge, these principles that we regard as fundamental are already everywhere accepted as imperative except among the spokesmen of the military and annexationist party in Germany. If they have anywhere else been rejected, the objectors have not been sufficiently numerous or influential to make their voices audible. The tragical circumstance is that this one party in Germany is apparently willing and able to send millions of men to their death to prevent what all the world now sees to be just.

I would not be a true spokesman of the people of the United States if I did not say once more that we entered this war upon no small occasion and that we can never turn back from a course chosen upon principle. Our resources are in part mobilized now, and we shall not pause until they are mobilized in their entirety. Our armies are rapidly going to the fighting front, and will go more and more rapidly. Our whole strength will be put into this war of emancipation—emancipation from the threat and attempted mastery of selfish groups of autocratic rulers—whatever the difficulties and present partial delays.

We are indomitable in our power of independent action, and can in no circumstances consent to live in a world governed by intrigue and force. We believe that our own desire for a new international order, under which reason and justice and the common interests of mankind shall prevail, is the desire of enlightened men everywhere. Without that new order the world will be without peace and human life will lack tolerable conditions of existence and development. Having set our hand to the task of achieving it, we shall not turn back.

I hope that it is not necessary for me to add no word of what I have said is intended as a threat. That is not the temper of our people. I have spoken thus only that the whole world may know the true spirit of America—that men everywhere may know that our passion for justice and for self-government is no mere passion of words, but a passion which, once set in motion, must be satisfied. The power of the United States is a menace to no nation or people. It will never be used in aggression or for the aggrandizement of any selfish interest of our own. It springs out of freedom and is for the service of freedom.

LLOYD GEORGE SEES NO GENUINE PEACE.—London, February 12.—Addressing the House of Commons to-day at its reassembling after prorogation last week, Premier Lloyd George said he had read with profound disappointment the replies given to President Wilson and to the declarations of the British Government by Count von Hertling and Count Czernin, and added that it was perfectly true that, as regarded the tone, there was a great deal of difference between the two speeches, and he wished he could believe there was a difference in substance, but when there was a question of considering the real demands of the allies, he said, Count Czernin was adamant. He remarked that he would like any member to point out anything in the speeches of Count Czernin or Count von Hertling which could possibly be

regarded as proof that the Central Powers were prepared to make peace on terms which could be regarded as just and reasonable.

Germany's action regarding Russia, he said, proved that her declaration regarding no annexations had no real meaning. No answer had been given regarding Belgium that could be regarded as satisfactory, he declared; no answer had been given regarding Poland or France, with her legitimate claims for the restoration of her lost provinces; not a word had been said about the thousands of the Italian race and tongue now under the Austrian yoke.

Until there was some better proof than had been provided in the speeches to which he referred that the Central Powers were prepared to consider the aim and ideals for which the allies were fighting, said Mr. Lloyd George, it would be the nation's regrettable duty to go on and make preparations necessary in order to establish international rights.

The Premier said the government stood by the considered declaration made at the meetings with the trade union representatives early this year. It did not recede in the least from its war aims as they had been stated. It was no use, he said, crying peace when there was no peace.—*N. Y. Times*, 13/2.

FURTHER DISCUSSION TO FOLLOW.—It was announced from Berlin that Count von Hertling would take up the Ukraine Peace Treaty and President Wilson's message during the Reichstag sessions beginning February 21.

PEACE WITH UKRAINE

In the peace negotiations at Brest-Litovsk, the representatives of the Central Powers deprived the Bolshevik commissioners of the chief card in their hands—Russian food supplies—by negotiating a separate peace with the newly formed republic of Ukrainia, comprising within its tentative boundaries one-third of the agricultural lands of Russia. The advantage to the Central Powers of this policy of separatism in Russia is obvious, since it not only divides the country into warring factions, but enables the Central Powers to conclude advantageous commercial and economic bargains with the weak states thus formed. The agreement with Ukrainia, however, created some difficulties, since the cession to the new state of the small district of Cholm in Russian Poland raised the hot antagonism of all Polish elements within the two empires. Furthermore, at the time of the treaty a struggle was still going on in Ukrainia between the bourgeois government under the Rada or legislative assembly, and the rival government set up by the Bolsheviki.

The treaty, which was signed February 8, established the old Austro-Russian frontier as the western boundary of the new state and gave it a liberal northern frontier at the expense of the rest of Russia. In particular, the treaty provided rates of exchange and other agreements for reopening trade. The terms of the treaty are in part as follows:

The treaty is entitled: "A Treaty of Peace Between Germany, Austria-Hungary, Bulgaria, and Turkey on one Part and the Ukrainian People's Republic on the Other."

The preamble states that the Ukrainian people, having in the course of the present world war declared itself to be independent and expressed a wish to restore peace between itself and the powers at war, desires "to take the first step toward a lasting world's peace, honorable to all parties, which shall not only put an end to the horrors of war, but also lead to the

restoration of friendly relations of the peoples in political, legal, economic, and intellectual realms."

The names of all of the plenipotentiaries engaged in the negotiations are then set forth, and they are declared to have reached an agreement on the following points:

Article I.—Germany, Austria-Hungary, Bulgaria, and Turkey on the one hand and the Ukrainian People's Republic on the other declare that the state of war between them is at an end. The contracting parties are resolved henceforth to live in peace and friendship with one another.

Article II.—Between Austria-Hungary on the one hand and the Ukrainian People's Republic on the other hand, as far as these two powers border one another, those frontiers will exist which existed before the outbreak of the present war between the Austro-Hungarian monarchy and Russia. Further north the frontier of the republic beginning at Tarnegrad will in general follow the line of Bilgerey to Sroezeberzszyn, Krasnostau, Pugaszce, Radzyn, Meshiretschei, Sarnaki, Selnik, Wysekelitowsk, Kamietslitowsk, Prushany, and Wydozowskyesee. This will be fixed in detail by a mixed commission according to ethnographical conditions and with a regard to the desires of the population. Should the Ukrainian People's Republic yet have common frontiers with another of the powers of the Quadruple Alliance, special agreements will be made thereon.

Article III.—The evacuation of occupied territories will begin immediately after the ratification of the present treaty. The manner of carrying out the evacuation and transfer of the evacuated territories will be determined by the plenipotentiaries of the interested parties.

Article IV.—The diplomatic and consular relations between the contracting parties will be entered upon immediately after the ratification of the peace treaty. The widest possible admittance of the respective parties to Consuls is to be reserved for a special agreement.

Article V.—The contracting parties mutually renounce the reimbursement of their war costs—that is to say, the state expenditure for carrying on the war, as well as indemnification for damages—that is to say, those damages suffered by them and their subjects in the war, as through military measures, including all requisitions made in the enemy's countries.

Article VI.—The respective prisoners of war will be permitted to return home, and, as far as they do not desire, with the approval of the state concerned, to remain in its territories or proceed to another country. The regulation of the questions connected herewith will follow by means of separate treaties provided for in Article VIII.

Article VII.—The contracting parties undertake mutually and without delay to enter into economic relations and organize an exchange for goods on the basis of the following prescriptions:

1. Until the 31st day of July of the current year reciprocal exchange of the more important surplus supplies of agricultural and industrial products will be carried out as follows for the purpose of covering current requirements: The quantities and sorts of products to be exchanged will be settled by a joint commission, to sit immediately upon the signature of the peace treaty. Prices will be regulated by the joint commission. Payments will be made in gold on the basis of 1000 German imperial gold marks as the equivalent of 462 gold rubles of the former Russian Empire, or 1000 Austro-Hungarian gold kroner as the equivalent of 393 rubles, 78 kopeks of the former Russian Empire. The exchange of goods fixed by the joint commission aforementioned, which commission will consist of equal numbers of representatives of both parties, will take place through state central bureaus. The exchange of those products which are not fixed by the aforementioned commission will take place by the way of free trade, according to the stipulation of a provisional commercial treaty.

2. So far as it is not otherwise provided, the economic relations between the contracting parties shall continue provisionally, and in any case until the conclusion of a final commercial treaty. But until the termination of

a period of at least six months after the conclusion of peace between the Central Powers on the one part and the European states at war with the Central Powers, as well as the United States and Japan on the other part, certain prescriptions are laid down as a basis of relations.

From N. Y. Times, Feb. 17

DISMEMBERED RUSSIA.

As regards economic relations between Germany and Ukraine the text of the treaty prescribes what parts of the Russo-German commercial and shipping treaties of 1894 and 1904 shall be put into force. The contracting parties further agree to maintain the general Russian customs tariff of January 13, 1903.

The treaty also provides (Section 3) which parts of the Austro-Hungarian-Russian commercial and shipping treaty of February 5, 1906, shall be maintained, and adds:

All parties agree that all articles transported across the territory of either party shall be free of duty. Trade-mark agreements are resumed, and the contracting parties agree to support each other in restoring railway tariffs. Economic relations between Bulgaria and Turkey and Ukraine are to be settled according to the most favored nation definition until definite commercial treaties are concluded.

If the period provided for in the first paragraph of Section 2 should not occur before June 30, 1919, each of the two contracting parties is free from June 30, 1919, to give six months' notice to terminate the prescriptions contained in the above-mentioned section.

Articles 4 and 5 provide that neither party shall claim preferential treatment such as conferred upon some third adjoining country by customs alliance, and that all importation restrictions shall be removed on goods of either party stored in neutral states.

Article VIII.—Restoration of public and private legal relations, the exchange of prisoners of war and interned civilians, the question of amnesty and the question of the treatment of merchantmen in enemy hands will be regulated in separate treaties with the Ukrainian People's Republic, to form an essential part of the present peace treaty, which, so far as practicable, will take effect simultaneously therewith.

Article IX.—The agreements made in this peace treaty form an indivisible whole.

Article X.—For the interpretation of this treaty the German and Ukrainian texts are authoritative in regard to relations between Germany and Ukraine, the German, Hungarian, and Ukrainian texts for relations between Austria-Hungary and Ukraine, the Bulgarian and Ukrainian texts for relations between Bulgaria and Ukraine, the Turkish and Ukrainian texts for relations between Turkey and Ukraine.

The concluding part of the treaty provides:

"The present peace treaty will be ratified. Ratified documents shall be exchanged as soon as possible. So far as there are no provisions to the contrary, the peace treaty shall come into force on ratification."

The supplementary treaties provided for in Article VIII, also were signed. They cover the following points:

Restoration of consular relations.

Restoration of state treaties.

Restoration of civil law.

Indemnification for civil damages caused by laws of war or by acts contrary to international law.

Exchange of war prisoners and interned civilians.

Care of burial grounds of those fallen in enemy territory.

Provision for the return to their homes of persons affected by the treaty.

Treatment of merchant vessels in enemy hands.

The Brest-Litovsk dispatch says that the text of the supplementary agreements must be withheld for the present to avoid overcrowding the telegraph wires.

POPULATION AND RESOURCES OF UKRAINE

The population of Ukraine consists of about 28,000,000 Ruthenians, or Little Russians, speaking a dialect differing from Great Russian as Lowland Scotch from English. Three million members of the same race inhabit the Austrian province of Galicia. The old régime in Russia opposed every nationalistic aspiration on the part of the Ukrainians, denying the Little Russian dialect any official status in court or schools. As a result, in spite

of the fact that the Poles have been favored at the expense of the Ruthenians in Galicia, there has been a flourishing pro-Austrian propaganda within the Ukraine which has facilitated the present outcome.

The Ukrainian movement in Russia is partly national and partly a land question. The Bolsheviki, who believe in a redistribution of land, emphasize the latter; the Rada group stand alone on their separate and proclaimed nationality.

Both questions, however, are of as great importance to Austria-Hungary as they are to Russia, for the Ukraine include not only the southeastern provinces of Russia, but a large portion of territory in East Galicia, in Northeastern Hungary and in Bukovina, and in the latter territories the national character of the movement is most pronounced. This is in the main due to the policy of the Austrian Government before the war, which favored the Ukrainians of East Galicia in proportion as the old Russian Government persecuted them. The result was that Lemberg became the intellectual center of the Ukrainians where refugees from Kiev found a ready welcome.

Just a month after the March revolution in Petrograd, the Ukrainian National Congress was opened at Kiev. It confined itself to a proclamation of national territorial and political entity and provided for the election of the Rada. The election was held immediately, and the Rada, from a National Council, later transformed itself into a legislature under the presidency of Professor Hrushevski.

When the Provisional Government collapsed the Rada lost no time in grasping the situation. Its first act was to attempt to prevent the spread of Bolshevism in the Ukraine; its second was to present its nationalist question to the Central Powers and attempt to negotiate peace on that basis in exchange for the vast stores of wheat and other supplies which had been collected at Kiev and neighboring cities for the use of the Southern Russian armies.

On November 20 the government of the Ukraine was entirely reconstructed on democratic lines, with Socialist proclivities. Its president was M. Vinnitchenko, himself a Social Democrat. Professor Hrushevski was still president of the Rada. Warned by the fate of Kerensky, the government pursued what it called a "Nationalist Democratic" course, supported by, but not recognizing, the bourgeoisie on the one hand and on the other opposing the extreme demands of the Bolsheviki.

The new republic, if it can maintain its existence, will control about 850,000 square kilometers, with Kiev as its chief city, and the port of Odessa on the Black Sea, through which, before the war, 70 per cent of Russia's exports were shipped. Ukraine, comprising one-sixth of European Russia, has 32 per cent of all the farm land, about 60 per cent of the iron mines, 75 per cent of the coal, and in peace time about 30,000,000 head of cattle.

One difficulty in developing trade with the Central Powers will be the present disorganization of the country and lack of railroad facilities, there being but one or two rail routes across the border, with a change of gauge at the frontier. Upon peace with Roumania, goods could be shipped by way of the Danube.

OPPOSITION OF THE POLES.—The Austrian Poles, furious "at the violation of the national unity" by the peace with the Ukraine and the old Polish territory thereby handed over to the Little Russians, are uniting with the Czechs, Italians, Rumanes, and South Slavs. In parliament these anti-German elements slightly exceed the government bloc. The Social

Democrats hold the balance of power, and they are expected to use it to overthrow the government. Meanwhile, in Cracow, which still remembers its part in the Polish insurrections of 1830 and 1846, the peace with the Ukraine is celebrated by the displays of black flags, insulting the festivity at Vienna. The position of the Austrian Government has been ticklish for a long time. The bitterness and the independent policy of Czechs, Slavs, Slovenes, Slovaks, Poles against that government have been steadily increasing. The worse the plight of Austria the sharper the demands of the discontented nationalities.—*N. Y. Times*, 17/2.

COUNT CZERNIN ON UKRAINE PEACE.—Amsterdam, February 15.—A dispatch received here from Vienna says that Count Czernin spoke as follows of the treaty with Ukraine:

"What has happened at Brest-Litovsk," Count Czernin said, "is not yet the end of the war, but it is the beginning of the end. Not only political diseases but political recoveries are infectious, and peace will be so, too.

"Moreover, the strangling blockade of the Entente has been broken by the signing of the peace with the Ukraine, with its bread. The difficulties of transport certainly still are considerable, but all necessary preparations have been made, and, if conditions do not alter, an improvement will take place."

Count Czernin added that he had assurances that Austrian prisoners of war would be released. Civil war between Russia and the Ukraine might cause difficulties, but he was full of hope. In conclusion Count Czernin said:

"If ever confidence was justified, it is to-day. I am firmly convinced that we have only to hold out a little longer and an honorable general peace will be attained."—*N. Y. Times*, 16/2.

TROTZKY BREAKS OFF NEGOTIATIONS

On February 10, following the peace treaty with Ukraine, negotiations ended between the Bolsheviki and the Central Powers, Leon Trotzky refused to accept the terms offered by Germany, but at the same time declared Russia out of the war. The following official statement was issued explaining the attitude of the Bolshevist Government.

The peace negotiations are at an end. The German capitalists, bankers, and landlords, supported by the silent co-operation of the English and French bourgeoisie, submitted to our comrades, members of the peace delegations at Brest-Litovsk, conditions such as could not be subscribed to by the Russian revolution.

The governments of Germany and Austria possess countries and peoples vanquished by force of arms. To this authority the Rusian people, workmen and peasants, could not give its acquiescence. We could not sign a peace which would bring with it sadness, oppression, and suffering to millions of workmen and peasants.

But we also cannot, will not, and must not continue a war begun by Czars and capitalists in alliance with Czars and capitalists. We will not and we must not continue to be at war with the Germans and Austrians —workmen and peasants like ourselves.

We are not signing a peace of landlords and capitalists. Let the German and Austrian soldiers know who are placing them in the field of battle and let them know for what they are struggling. Let them know also that we refuse to fight against them.

Our delegation, fully conscious of its responsibility before the Russian people and the oppressed workers and peasants of other countries declared on February 10, in the name of the Council of the People's Commissaries of the government of the Federal Russian Republic to the governments of

the peoples involved in the war with us and of the neutral countries, that it refused to sign an annexationist treaty. Russia, for its part, declares the present war with Germany and Austria-Hungary, Turkey, and Bulgaria at an end.

Simultaneously, the Russian troops receive an order for complete demobilization on all fronts.

The signatures of Leon Trotzky and other members of the delegation are appended.

FUTURE COURSE OF GERMANY.—In spite of the bewildering situation created by the action of Trotzky, it appeared clear from despatches of February 17 that Germany would require military forces to maintain her eastern line, and that she would be called upon to give military support to the Ukraine. At this date Germans and pro-Germans in Russia were being arrested, and the German commission at Petrograd found it difficult to continue negotiations for the exchange of prisoners.

Austria manifested an unwillingness to take further part in hostilities against Russia.

RUMANIA

Despatches of February 10 stated that Field Marshal von Mackensen had sent an ultimatum to the Rumanian Government on February 6 demanding that peace negotiations be entered upon within four days. Newspaper discussion in Germany indicated a possible policy on the part of the government to offer Rumania compensation in the Russian territory of Bessarabia for the loss of Dobrudja to Bulgaria.

The resignation of the veteran Premier of Rumania, Bratiano, was reported on January 28, and was explained as the result of disagreement between liberal and conservative factions within the cabinet. Despatches of February 15 announced a non-partisan ministry under General Averescu, former Minister of War, and lately commander in Dobrudja.

As a result of the occupation of parts of Bessarabia by Rumanian forces and hostility to Bolshevist propaganda on the part of Rumania, the Bolshevist Government on January 26 announced that diplomatic relations with Rumania were broken off, and that the Rumanian gold reserves in Moscow, amounting to 1,200,000,000 rubles, were to be seized.

SECRET DOCUMENTS PUBLISHED

The N. Y. *Evening Post* of January 25, 26, and 28 published a series of secret agreements, telegrams, memoranda, etc., exchanged between the Western Powers and the old régime in Russia. These had been thrown before the world by the Bolsheviki as evidence in their case against the ruling powers in both groups of belligerents. While the documents reveal the pitfalls and evils of secret diplomacy, it is difficult to see how the Entente could have united and increased its strength without such bargaining. There is little in the documents that has not been for some time a matter of common knowledge or general suspicion.

Foreign Minister Trotzky contributes a preface condemning secret diplomacy as part and parcel of "imperialistic rapaciousness" and the "domination of capital." The contents may be listed as follows:

1. The Entente agreement with Italy (May, 1915) pledging military and naval cooperation, recognizing Italy's *irridenta* claims in Trent, Istria, and Dalmatia, and promising a loan from England of at least £50,000,000.

2. A memorandum from General Polivanof on the effect of Rumania's military defeat upon her territorial claims (November, 1916).

3. A confidential memorandum of offers to Greece of territory in southern Albania and Asia Minor (November, 1915–May, 1916).

4. An agreement for the future division of Asia Minor and the Near East (February 21, 1917).

5. Telegram from Sazanoff to Russian Ambassadors referring to future territorial adjustments and a project for excluding Germany from trade with China.

6. Telegram from Russian Foreign Office agreeing to French proposals for restoration of Alsace and neutralization of territory west of the Rhine (January 30, 1917).

7. Agreement to Russian control of Constantinople and the Dardanelles, with Constantinople a free port, and freedom of passage for merchant vessels through the straits (March 4, 1915).

8. Report of a conference of bankers from the Central Powers and the Entente at Berne in September, 1917, at which the German delegates proposed peace terms at the expense of Russia. Following the conference, according to a telegram from the Russian *chargé* at Berne, "an Anglo-Jewish financier stated that the German aim was to promote separation in Russia so far as possible, so as to split her up into small states. For Germany it will be easy to conclude commercial treaties with weaker states (Lithuania, Courland, etc.).

9. A series of telegrams from Foreign Minister Tereschenko to Russian diplomats abroad explaining changes in the Russian situation (August–October, 1917).

GERMANY

LABOR DISTURBANCES SUPPRESSED BY MILITARY FORCE.—During the last week in January strikes and peace riots broke out in Germany and spread with great rapidity, crippling the great war industries and threatening the government. At Hamburg the laborers in the Vulcan Works struck on Monday, January 27. At Kiel the workmen in government and private shipyards went out. It was estimated that there were nearly 500,000 strikers in Berlin alone.

The movement was under the control of Socialist leaders of both the majority and independent factions. A "Workmen's Council" was formed, with an "action commission" of 10 members including Haase, Scheidemann, Ledebour, Dittmann and other Socialist leaders. At the court martial of Dittmann, according to an Amsterdam despatch of February 6, he declared that the uprising was "a demonstration strike against a peace of annexations and in favor of a peace by understanding."

"If the government had entered into negotiations as requested," Dittmann testified, "the strike would have lasted only three days." Scheidemann supported Dittmann's testimony as to the political purpose of the strike. Dittmann was sentenced to five years' confinement for inciting to high treason.

The disturbances were in the nature of a counter-demonstration against the propaganda of the Fatherland or Pan-German party. Meetings of this party at Munich, Stuttgart, and elsewhere were broken up by hostile masses. At Munich, according to the *Tägliche Rundschau*, the singing of "Deutschland Ueber Alles" was drowned out by a crowd shouting the "Marseillaise." The following demands were addressed by the strikers to the government:

1. Accelerated conclusion of a general peace without indemnities or annexations.
2. Participation of workmen's delegates of all the countries in the peace pourparlers.
3. Amelioration of the food situation by better distribution.
4. Immediate abolition of the state of siege and restoration of the right of public meetings suspended by the military authorities.
5. Abolition of militarization of war factories.
6. Immediate release of all political prisoners.
7. Fundamental democratization of state institutions.
8. The institution of equal electoral suffrage by direct or secret ballot.

The strike movement was crushed within a week's time by strong military measures—declaration of martial law, arrest of strikers, and court martial of the leaders.

AMSTERDAM, February 4.

Although the German strike appears to be a pretty complete failure, nevertheless it will not remain without consequences. The attitude of the strikers and those who remained outside the movement is certain to be made more bitter.

Once more it has been impressed upon German workers that they live under a system which is little better than a military dictatorship. They will not fail to note the difference between the action of the German Government and that of the Austrian authorities. In Germany the government clamped down all freedom, refused to have anything to do with the workers, and left the military to put down the movement by force. Not for a minute did justice to the workers' demands influence the government. —*N. Y. Times*, 6/2.

AUSTRIA

STRIKES AND FOOD RIOTS.—On January 18 a general strike was proclaimed in Austria, 100,000 men quitting work in Vienna and Neustadt. While the strike was precipitated by the reduced flour ration, the delegates of the workmen informed the government that "the demand for peace took precedence over other demands."

The labor agitation in Austria excited great interest and expectation abroad, but it appears that it lasted not more than two or three days and was ended by consultations between the workmen and the government, after which the strikers went back to work.

The N. Y. *Herald* of February 7 wrote as follows:

"In the latest despatches there are intimations that the Austrian strike situation is clearing, the government having indicated its willingness to

accede to the surface demands of the strikers. That is not unlikely, and yet we may be just at the beginning of the wider agitation of which the strikes are an advance manifestation.

"More significant of a real situation in the dual monarchy than reports of happenings there which come by either of the long way around routes is the comment of the German press. *Vorwaerts* calls upon the German Government to negotiate peace on the Czernin program announced at Brest-Litovsk and is promptly suppressed. The *Tägliche Rundschau* charges the Austrian Government with promoting the "democratic internationalism" that in turn is assumed to have promoted the strikes throughout Austria-Hungary, while the *Frankfurter Zeitung* intimates that the strike situation is of Count Czernin's "stage management." The German press as a whole is critical. Austria-Hungary is reminded that its armies would have been wiped out except for German leadership and German support, and is taunted with lack of gratitude—which is rubbing salt into the open wound."

SEYDLER CABINET RESIGNS.—Amsterdam, February 8.—Dr. von Seydler, the Austrian Premier, has offered the resignation of his entire cabinet to Emperor Charles, according to a dispatch from Vienna.

The resignation of the cabinet, it is understood in parliamentary circles in Vienna, is due to the opposition of Polish Deputies to special debates and the provisional budget. The opposition of the Deputies makes a majority for the budget doubtful.

The cabinet of Dr. von Seydler, which was formed last June, was reported to have resigned while the recent labor crisis was on in Austria-Hungary. This report was not confirmed.

Dr. von Seydler was able to bring about the cessation of the strike by informing labor delegations on January 20 that it was the wish of the Austrian Emperor to end the war at the earliest possible moment by an honorable peace. Other members of his government promised labor and military reforms, after which the labor leaders ordered their followers to return to work. This virtually ended the strikes in Vienna.

The cabinet of Dr. von Seydler was of a stop-gap bureaucratic character, organized after it had been found impossible to form a ministry which could work with the Austrian parliament on a positive program of internal reform and reorganization.—*N. Y. Times*, 9/2.

UNITED STATES

ALL U. S. EXPORTS AND IMPORTS UNDER LICENSE.—By a sweeping proclamation issued February 15, President Wilson made subject to control by license the entire foreign commerce of the United States. The object of the proclamation was to release ships for the transport service to France, and it is estimated that at least 1,000,000 additional tons will be made available.

Trade with South America and the Orient will be largely affected, according to a statement of the War Trade Board on February 15. The action was decided upon finally when agreements with Holland and some of the other neutral nations of Europe brought within the control of the government 500,000 tons or more of shipping, which is not to be sent into the submarine zone. French sailing ships will also be used to take the place of some of the diverted American tonnage, and the general result will be the withdrawal within a comparatively short time of all American tonnage fit for overseas service from coastwise South American and Pacific trade.

It is possible also that with the reduction of trade between the United States and nations in the Orient, additional Japanese tonnage will be brought into the transatlantic service, thus contributing more directly to the war.

SHIPPING AGREEMENT WITH HOLLAND.—In London M. van Vollenhoven, special commissioner for Holland, and Charles H. Sherrill of the American War Trade Board, who represents all the allied governments, are completing details of an allied-Dutch agreement concerning Dutch shipping for the allies and allied food and other supplies for Holland. Holland is to receive rations of foodstuffs and industrial materials based on the known necessities of the country subject to the world shortage of food and raw stuffs. These will be carried in Dutch vessels. The entire residue of the Dutch merchant marine will then be placed at the allies' disposal for transportation needs outside the war and danger zone.—*N. Y. Times*, 12/2.

TRADE AGREEMENTS WITH NORTHERN NEUTRALS.—Our government's new trade agreement with Sweden, parts of which have been signed at London, completes the list of such compacts with the northern European neutrals. It follows acceptance of the War Trade Board's terms by Switzerland, Denmark, Finland, Holland, and Norway. Some of the Swedish ships lying at our ports will unload their cargoes and then, under charter to our government, go into the trade with South America. A few will be permitted to carry supplies to Sweden. A final decision as to the quantity and character of these has not been reached, and the terms soon to be accepted are not published. Undoubtedly they forbid the sale of food or metals to our enemies. Until a few months ago Germany was importing from Sweden large quantities of high-grade iron to be used in her munition factories.

All the northern neutral countries from which Germany in 1916 received food enough to support her entire army on the west front are now assenting to the blockade designed to deprive her of imported food, metals, and other essential products.—*N. Y. Times*, 31/1.

REVIEW OF BOOKS
ON
SUBJECTS OF PROFESSIONAL INTEREST

"Naval Power in the War." By Lieut. Commander C. C. Gill, U. S. Navy. Price $1.25 net. (New York: Geo. H. Doran Company.)

This book is a contemporaneous history of the naval aspect of the war and is written not so much with a view toward completeness in detail as with the idea of bringing out the necessary points of naval policy, strategy and tactics. The text had its origin in a series of lectures delivered by Lieut. Commander Gill to the midshipmen at the Naval Academy in 1915-1916 and first appeared in the *Current History Magazine* of the *New York Times*. In addition to a preliminary discussion of sea power and a general estimate of the situation, a chapter is devoted to each of the following naval actions: Heligoland Bight, Coronel, Falkland, Dardanelles, Dogger Bank and Jutland, with additional chapters on submarine and anti-submarine warfare and the naval lessons of the war. In the appendix there are articles on the comparative strength of navies, illustrated by excellent sketches and diagrams; the *Emden* exploits; and on America's part in the development of naval weapons and tactics. This book, which is in no sense propaganda, should meet the needs of the present popular interest in naval affairs, particularly in submarine warfare. It is used for instruction purposes at the U. S. Naval Academy in the naval history course in the department of English.

A. W. B.

"Small Arms Instructors' Manual, 1918." Compiled by the Small Arms Instruction Corps. 60 cents net. (New York: E. P. Dutton and Company.)

This is a manual of convenient size and moderate price that gives an excellent presentation of data required by every one whose duties in any way bear on the training of individuals and units in the use of small arms.

Inasmuch as it would be manifestly impossible to produce in one volume *all* the information and knowledge available on the use of the rifle and pistol, while at the same time it is highly desirable for instructors in this work to be equipped with a manual that contains the information essential to it, it is considered that this is a very valuable, not to say necessary, step to present in one volume the methods of training together with the data that is considered indispensable to an intelligent understanding not only of those methods, but of the use of small arms as they apply to both the soldier and the leader.

It is evident that those who prepared the work devoted considerable thought to their object, having in mind the needs of the instructor and also the limitations of the pupil, and the result is a book that presents clearly and

without excess verbiage the knowledge necessary for a competent instructor as well as for a good rifleman. The book should be in the hands of every one whose duties are in any way allied with the training of men in the use of small arms, either in the gallery, on the target range, or the battlefield.

A. D. R.

"The Flyer's Guide." By Captain N. J. Gill, Royal Artillery. $1.50 net. (New York: E. P. Dutton and Co.)

This book will be a valuable asset for the man who intends to become an aeroplane pilot. Captain Gill treats his subject in the most elementary manner, thereby making his book of especial interest to the beginner. The book is written from the beginner's viewpoint, and the facts brought out are those which generally puzzle the novice, and which are usually learned only after considerable practical experience. The subject is treated from a neutral standpoint in so far as any particular type of machine is concerned, and is equally interesting and instructive whether the prospective pilot intends to operate a biplane or a monoplane.

The author divides his subject into two main parts. The first deals in three chapters with the steps necessary to become a practical flyer and instructs in the art of taking care of an aeroplane. The first chapter deals with the steps necessary to obtain a pilot's license, the second with remarks on practical flying, and the third with the construction of aeroplanes. As said above these chapters are technical only in the smallest degree, but cite many valuable points necessary for the beginner to learn, which are generally only learned as the result of hard experience.

The second part covers, in three chapters, the elementary theory of flight, internal combustion engines, and ignition devices. No details are given of any particular engine or ignition device, but the description is such that the general theory of both is well covered. This part of the book shows the reader what it is necessary to study and thoroughly grasp before it is possible to become a practical aeroplane pilot.

This book is recommended to all who have the desire to become aeroplane pilots as it gives an excellent idea of what has to be studied and learned before becoming a successful practical flyer.

T. G. E.

"Army and Navy Uniforms and Insignia." How to know rank, corps, and service in the military and naval forces of the United States and foreign countries. With 8 illustrations in color and 117 in black and white. By Col. Dion Williams, U. S. Marine Corps. 294 pages. Price $1.50 net. (New York: Fred. A. Stokes Company, 1918.)

"Military and Naval Recognition Book." A handbook of the organization, insignia of rank, and customs of the world's important armies and navies. With 54 full-page plates, 18 in colors. By Lieutenant J. W. Bunkley, U. S. Navy. 218 pages. Pocket size. Price $1.00. (New York: Van Nostrand Company, December, 1917.)

Our entry into the war, with the sudden appearance of military and naval uniforms throughout the country, and the call to every village to sup-

ply its quota to one or another branch of the service, has naturally aroused a keen general interest in every aspect of military affairs. One phase of this interest, the layman's curiosity regarding the uniforms, insignia, and customs of our fighting forces, the books listed above are admirably designed to gratify. And in view of the intricacies of the subject and the space given to foreign armies and navies, they should also prove very useful to men both new and old within the service.

A brief comparison will suggest the scope of the two books and the main differences between them. Each gives about 68 pages to foreign uniforms. While Colonel Williams' book is considerably larger, the additional space is devoted chiefly to historical information and fuller descriptions. As regards the value of the latter, it may be said that in explaining rank and corps insignia, specialty marks, etc., the pictures are all-important; verbal descriptions are as difficult to visualize as a landscape in Scott's novels.

Colonel Williams gives 22 pages to the Marine Corps; Lieutenant Bunkley gives two. Similarly, the first writer gives much more space to the Coast Guard, Light House Service, and Coast and Geodetic Survey, and devotes 12 pages to the Health Service, which the second writer does not treat. On the other hand, there is nothing superfluous in the Recognition Book. Its style is concise, simple, and definite.

The complexity of the subject treated is indicated by the fact that slight errors appear in both volumes. Neither book mentions in the text the army second lieutenant's new half-inch gold shoulder bar and brown sleeve braid, though they appear in the plates. The anchor on a midshipman's collar is not "foul" (Bunkley, p. 110), and there seems no reason for spelling *sergeant* two ways on the same page (*Ibid.*, p. 92). A lieutenant commander is not identified by a "*silver* leaf" (Williams, p. 112); in fact, the emblem is properly described on p. 123. In view of the non-existence of a Belgian Navy, better subjects for illustration could perhaps be found than the flags of Belgian admirals and commodores (Williams, p. 56). When several cuts appear on the same page, the better practice would be to put the appropriate legend immediately under each, instead of together at the foot of the page, as in the author last mentioned. The difficulty is increased when, as on page 172, the legends appear on the wrong page.

These slips are mentioned as matters of detail, rather than as a reflection on the general excellence and accuracy of the two volumes, which represent most useful work well done.

A. F. W.

"The Fleets Behind the Fleet." By W. MacNeile Dixon, Professor in the University of Glasgow. 127 pages and two maps. Price 2s. 6d. (Hodder and Stoughton. Doran and Co., N. Y. agents.)

Here are 127 pages of fluent and readable rhetoric in praise of Britain's merchant seamen and fishermen in the war. It may pall a bit at times, for the admirable reticence of the average Britisher regarding his achievements is not always imitated by his chroniclers. The deeds which form the theme of the present volume are in truth beyond praise, and the tale of them needs little commentary. It is for this reason that the occasional facts and

concrete episodes the writer offers make us wish he had given more. Here are a few specimens:

"The gear of the trawler *Pelican* was just being hove in when a mine was discovered entangled in the warp. The winch was stopped just as the mine bumped—anxious moment—the ship's side. The skipper ordered all hands into the boat and to pull away. Remaining alone on board, with infinite care he worked to clear the mine, gently, very gently, unwinding the gear of the winch. The men lay on their oars at a safe distance and waited in suspense. At last the mine was released and the skipper paid out 120 fathoms of line. Hardly was it done when, having touched something, the devil-fish exploded, shaking the trawler from stem to stern and half filling the distant boat with water."

The *Strathearn*, with other trawlers, was attacked by a submarine. "While the shots were falling round, some of the crew shouted to Geordie, the skipper, 'Geordie, get the boat out.' Said Geordie, 'I'll see you in hell first! Fire up! If she's gaun doon, I'm gaun doon. Fire up! I think we hae a chance.' During this time Geordie was making toward another trawler, the *Commissioner* (armed), which had her gear down and seemed totally unconcerned. But as soon as the *Strathearn* passed her, and there was nothing between the submarine and herself, a blow with an axe cut her gear away, she swung round, and at the same moment, her gun appeared. . . . The fifth shot sent the submarine down in flames."

Here is the tribute of a destroyer commander, meeting a Channel trawler in a snow squall: "'They're It, absolutely It,' said the captain, 'No weather's too bad for 'em. They're our eyes and our ears. They know every blessed wave in the Channel, not merely as passing acquaintances, but they address 'em by their Christian names. They'll do anything, and go anywhere and chance the luck. They're just simple fishermen, but they run the whole show and they run it magnificently—guns, semaphores, wireless, everything! They live on kippers and tea, and I don't believe they ever go to sleep.'"

The book may be journalistic in treatment, but it is right in spirit. It brings home the fact that a nation's naval power must be calculated "in the broad terms of men and ships"—not her military navy alone, but her seafaring population and her merchant marine.

A. F. W.

"Finding and Stopping Waste in Modern Boiler Rooms." By Engineers of the Harrison Safety Boiler Works. Cloth, 9 inches by 7 inches; 276 pages; 213 illustrations; $1.00. Philadelphia, Pa.

The saving of coal is the purpose of this practical handbook, which is addressed to power plant owners, managers, engineers and firemen. The preface states that such statements, tables, charts, etc., have been selected as were supported by experiments and tests, references being given wherever possible to the original authorities. The latter include many well-known engineers and writers in technical periodicals, also authors of papers before engineering societies, while the excellent bulletins on the utilization

of fuel issued during recent years by the United States Bureau of Mines have been freely drawn upon. Pains have been taken to compare statements and to check each source of information against others.

The work is divided into five sections, the first of which is about "Fuels," under which are considered the coals of the United States and their classifications, size of coal, coal sampling, proximate analysis, ultimate analysis, heating value of coal, ash and clinker, value of coal for steaming purposes, purchase of coal under specification, washing of coal storage and weathering of coal, coal measurement, oil fuels and gaseous fuels.

The second section is on "Combustion," taking up the chemistry of combustion air theoretically required, grates and grate surface, hand firing methods, thickness of fire, mechanical stokers and their operation, furnace temperature, furnace gases, clinker, draft, flue and stack proportions, draft required by stokers, mechanical stokers, draft gages, dampers, flue gas temperatures, flue gas analyses, CO_2 recorders, what CO_2 indicates, what CO indicates, air requirements and supply, preventing excess air, smoke and smoke prevention, burning oil fuel, burning gaseous fuels, and burning powdered coal.

The third section treats of "Heat Absorption," including heat transmission by conduction, convection and radiation, heat transfer from a fluid in a channel, heat transfer in economizers, air heaters and superheaters, improving heat absorption, relation between heating surface and boiler capacity, boiler setting, refractories and fire brick, soot, scale, softening feed water, and feed water heating.

The fourth section on "Boiler Efficiency and Boiler Testing" covers heat balance, heat absorbed by boiler, heat losses due to moisture in the coal, hydrogen, chimney gases, CO, combustible in the ash, moisture in the air, and unaccounted for loss, efficiencies, efficiencies with different coals, boiler capacity and efficiency, and boiler trials.

The fifth section on "Boiler Plant Proportioning and Management," discusses various arrangements of auxiliaries with regard to their effect upon feed heating, and also describes the Polakov functional system of boiler room management.

The book has been compiled by George H. Gibson, member American Society Mechanical Engineers, assisted by Percy S. Lyon, now captain of Coast Artillery. The proofs were read by Mr. Henry Kreisinger, who conducted for the U. S. Bureau of Mines many of the investigations quoted in the text.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-fifth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be two dollars and fifty cents, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly; subscription for non-members. $3.00; enlisted men, U. S. Navy, $2.50. Single copies, by purchase, 30 cents; issues preceding January, 1918, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1919

A prize of two hundred dollars, with a gold medal, and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best essay on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the essay.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All essays published in the PROCEEDINGS during 1918, which are deemed by the Board of Control to be of sufficient merit, will be passed upon by the Board during the month of January, 1919, and the award for the prize will be made by the Board of Control, voting by ballot.

2. No essay received after November 1 will be available for publication in 1918. Essays received subsequent to November 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best essay published during 1918 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. Essays are limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

6. It is requested that all essays be submitted typewritten and in duplicate; essays submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

G. M. RAVENSCROFT,
Lieut. Commander, U. S. N., Secretary and Treasurer.

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training; (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

LIST OF PRIZE ESSAYS

"WHAT THE NAVY HAS BEEN THINKING ABOUT"

1879

Naval Education. Prize Essay, 1879. By Lieut. Commander A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut. Commander C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser Best Suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of Its Decline and the Means to Be Taken for Its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut. Commander F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How May the Sphere of Usefulness of Naval Officers Be Extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill Are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: Its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut. Commander W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for Our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: Their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to Her Pneumatic Battery. Prize Essay, 1894. By Lieut. Commander Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut. Commander Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

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Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut. Commander Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

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Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

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Gunnery in Our Navy. The Causes of Its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure Its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear Admiral Stephen B. Luce, U. S. N.

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Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut. Commander A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A Few Thoughts on Our Next Step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut. Commander Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

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A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENCE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut. Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotton, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut. Commander T. D. Parker, U. S. N.

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The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut. Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut. Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-day. Prize Essay, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. N.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. N.

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The Rôle of Doctrine in Naval Warfare. Prize Essay, 1915. By Lieut. Commander Dudley W. Knox, U. S. N.

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DEFENCE AGAINST SURPRISE TORPEDO ATTACK. Third Honorable Mention, 1915. By Ensign R. T. Merrill, 2d, U. S. N.

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The Moral Factor in War. Prize Essay, 1916. By Lieutenant (J. G.) H. H. Frost, U. S. N.

NAVAL PERSONNEL. First Honorable Mention, 1916. By Lieut. Commander J. K. Taussig, U. S. N.

EDUCATION AT THE U. S. NAVAL ACADEMY. Second Honorable Mention, 1916. By Lieutenant Ridgely Hunt, U. S. N.

SOME UNDERLYING PRINCIPLES OF MORALE. Third Honorable Mention, 1916. By Commander Dudley W. Knox, U. S. N.

LARGE *vs.* A GREATER NUMBER OF SMALLER BATTLESHIPS. Lippincott Prize Essay. By Lieut. Commander Thomas Lee Johnson, U. S. N.

1917

Commerce Destroying in War. Prize Essay, 1917. By Commander Lyman A. Cotten, U. S. Navy.

THE PEOPLE'S RÔLE IN WAR. First Honorable Mention, 1917. By Lieutenant H. H. Frost, U. S. Navy.

THE NATION'S GREATEST NEED. Second Honorable Mention, 1917. By Colonel Dion Williams, U. S. Marine Corps.

1918

Letters on Naval Tactics. Prize Essay, 1918. By Lieutenant H. H. Frost, U. S. N.

THE PREPAREDNESS OF THE FUTURE. First Honorable mention, 1918. By Commander H. O. Rittenhouse, U. S. N. Retired.

NAVAL STRATEGY. Second Honorable Mention, 1918. By Rear Admiral Bradley A. Fiske, U. S. N.

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